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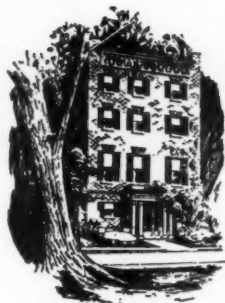
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The American Forestry Association is a national organization—independent and non-political in character—for the advancement of intelligent management and use of forests and related resources of soil, water, wildlife and outdoor recreation. Its purpose is to create an enlightened public appreciation of these resources and the part they play in the social and economic life of the nation. Created in 1875, it is the oldest national forest conservation organization in America.

FORESTS

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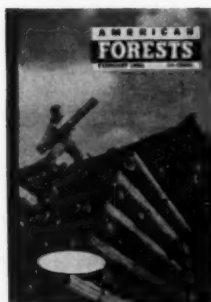
JAMES FISHER
Art Director

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THE COVER

The pyramid of pulpwood on this month's cover—a part of the almost ten million cords fed into southern pulp mills in 1948—reflects the phenomenal growth of wood-using industries in the South in recent years. Use of lumber has also increased apace. To help maintain the supply and provide for future needs, the industries and railroads—including Southern, Atlantic Coast Line and Central of Georgia—have all inaugurated vigorous forestry programs but the leader in this new movement has been the Seaboard Air Line Railroad whose program is described in this issue.

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LETTERS TO THE EDITOR

Letter from Connecticut

I enjoy your magazine very much. It fills an important need for educating people, especially in this state, where forests or even woodlots are little appreciated for mutual benefit of everyone. There has been a critical shortage of water over all the state due primarily to lack of precipitation. The water table is lower now than for many years. Few people realize the relation between forests and water retention. About half of this state's acreage is woodland but it must be poorly managed or located because during spring rains all streams are loaded with mud—probably a high percentage of topsoil. There seems little hope of improvement; small towns are increasing assessed value of land, and woodland near towns and cities is gradually being turned into real estate developments.

H. D. Howe

Ansonia, Connecticut

Pardon Us, Houston

Your December number of *American Forests* seems to me to be an unusually interesting and attractive one. But why in the world did you erase Houston from the map on page 7? Didn't you know that the old Spanish Trail runs from New Orleans to Houston, thence to San Antonio, and then on to El Paso and Los Angeles?

H. M. Seaman

Vice-President and General Manager
Kirby Lumber Corporation

Houston, Texas

Stepping Up the Pace

I read the article on "Log Rolling in Reverse" in the December issue of *American Forests*. It is certainly complimentary to the people of Benton County, Tennessee, as well as myself.

Although it is complimentary to the Benton County people, I wish to add that it is nothing more than facts and that we are planning to continue with an expanded program along the same line.

James W. Hamilton

Camden, Tennessee

This is a Good Idea

I became a member of The American Forestry Association in April of this year and have been enjoying the benefits of it, especially the fine articles in *American Forests*. I have been impressed by the broad scope of these articles—you might even change the name of the periodical to *American Resources*! However, I have noted what seems to me a serious omission. In the issues I have received this year I have seen no mention at all of the oak wilt disease. My attention has been called to it by a long article on it in *American Nurseryman*, issue of November 15, 1949. Due to the extremely serious threat to all of our oak species by this disease I believe it should be given wide publicity in magazines such as *American Forests* so that your enlightened readers will demand that all possible measures be taken at once to combat this menace.

Thompson V. Palmer

Concordville, Pennsylvania

Still Much To Do

It is very interesting to know of the many things that were done this year by The American Forestry Association and I hope it will be able to continue to prove to our citizens the value of forests and therefore cause landowners to keep a timber lot. And this must not be "just a timber lot," but kept productive. Not that a certain amount of timber should be cut each year, but that there must be new ones ready to grow up and take place of those trees that are cut. In cutting trees down, care should be taken and have them fall where they do the least damage to younger growth trees.

It is the case with many owners of woodlands, especially the farm woodlots, that the owner does not provide so that future generations of the family may have the same services of the forest as those of the past, by doing selective cutting. Grazing is the greatest thing that prevents young trees from getting a good start and keeping a productive woodlot. I see a number of cases of where the owner tells what a nice woods he has, but many of these have been pastured to the extent that there is no small growth, and the woods is more like a grove than a woods.

Oscar McKinley Bryens

Three Rivers, Michigan

On Silt Control

In all the articles I have read about irrigation and flood control, I have yet to read one practical suggestion for the control of silt.

It seems to me that it is entirely within the realm of possibility to enlist the aid of natural forces in the elimination of this problem.

A current of water will deposit or wash away silt according to the shape of the bed. A rolling current keeps the silt in solution, or rather suspension, by the nature of its motion whereas a sluggish current will deposit its load of silt like a settling tank. A few spikes set into the bed of a stream at just the right angle may be sufficient to keep the water in a boiling or rolling motion.

Then, there is valuable silt that the farmer may appreciate having carried onto his land, as against the kind of clay silt that would bog down his fields. In the latter case it would be very advisable, it seems to me, to spill it over the dam by the simple expedient of placing a baffle above the dam to cause the spilled water to be drawn from the bottom of the reservoir.

Let's hear from some others on this subject. I would like to hear what some authorities have to say about it.

Bob Olds

Westmont, Illinois

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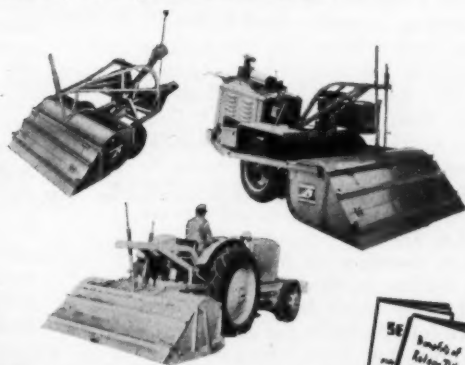
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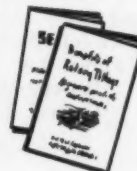
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HOW GOES FORESTRY?

New forest progress study to determine trends in United States since 1944 is initiated by the AFA as a service to foresters and the public

A STUDY initiated by The American Forestry Association to determine plus and minus trends in American forestry since the completion of the last major forestry appraisals in 1944 will be released sometime this fall as a service to foresters and the public and will provide information needed to obtain a 1950 perspective of the overall forestry picture in the nation.

Forestry thinking in the United States in the last five years has been predicated largely on the status of conditions as reported in 1946 by the American Forest Congress based on the 1944 appraisals of The American Forestry Association and the U. S. Forest Service. Evidence now exists that these appraisals—the rock on which many postwar action programs were founded, including the Association's Program for American Forestry—need pointing up not only in terms of continuing progress in many fields of public and private forestry in the last five years but also to ascertain whether activity in some fields has remained static or actually retrogressed.

To put present-day thinking on a factual footing, the Board of Directors of The American Forestry Association, invited Ovid Butler, director emeritus, to serve as chairman of a Forest Progress Committee—actually a steering committee that will serve as a clearing house for reports from experts in specialized fields. Assisting Mr. Butler are A. G. Hall, secretary; Henry Clepper, John D. Coffman, G. H. Collingwood, George W. Dean, George A. Duthie, Charles A. Gillett, R. C. Hall, L. F. Kneipp, R. E. McArdle, James E. Scott and Edward Stuart, Jr.

Key foresters all over the nation are heading up the studies in specialized fields which have been broken down into the following categories:

Forest fire protection—A. A. Brown, chief, Division of Fire Control, U. S. Forest Service.



Insect and Disease Protection—Dr. Lee Hutchins, Bureau of Plant Industry.

Control of Destructive Forest Practices—G. H. Collingwood, Legislative Reference Service, Library of Congress, former AFA forester and a member of the staff of the Hoover Commission.

Forest Planting—George A. Duthie, formerly with the U. S. Forest Service.

Taxation, Credits and Insurance—Dr. Ralph W. Marquis, U. S. Forest Service.

Research (Forest and Forest Products)—Henry Clepper, Society of American Foresters.

Forest Ownership—John B. Woods, private forester and former head of the Forest Resource Appraisal of The American Forestry Association.

Parks, Wildlife, Water and Other Non-Timber Values of Forests—Howard Zahniser, Wilderness Society.

Forest Surveys—Dr. E. C. Crafts, U. S. Forest Service.

Financial Status of Forestry Movement—James E. Scott, formerly with the U. S. Bureau of the Budget.

Public Education to Importance of Forests to Economic and Social Life—S. L. Frost, executive di-

rector, The American Forestry Association.

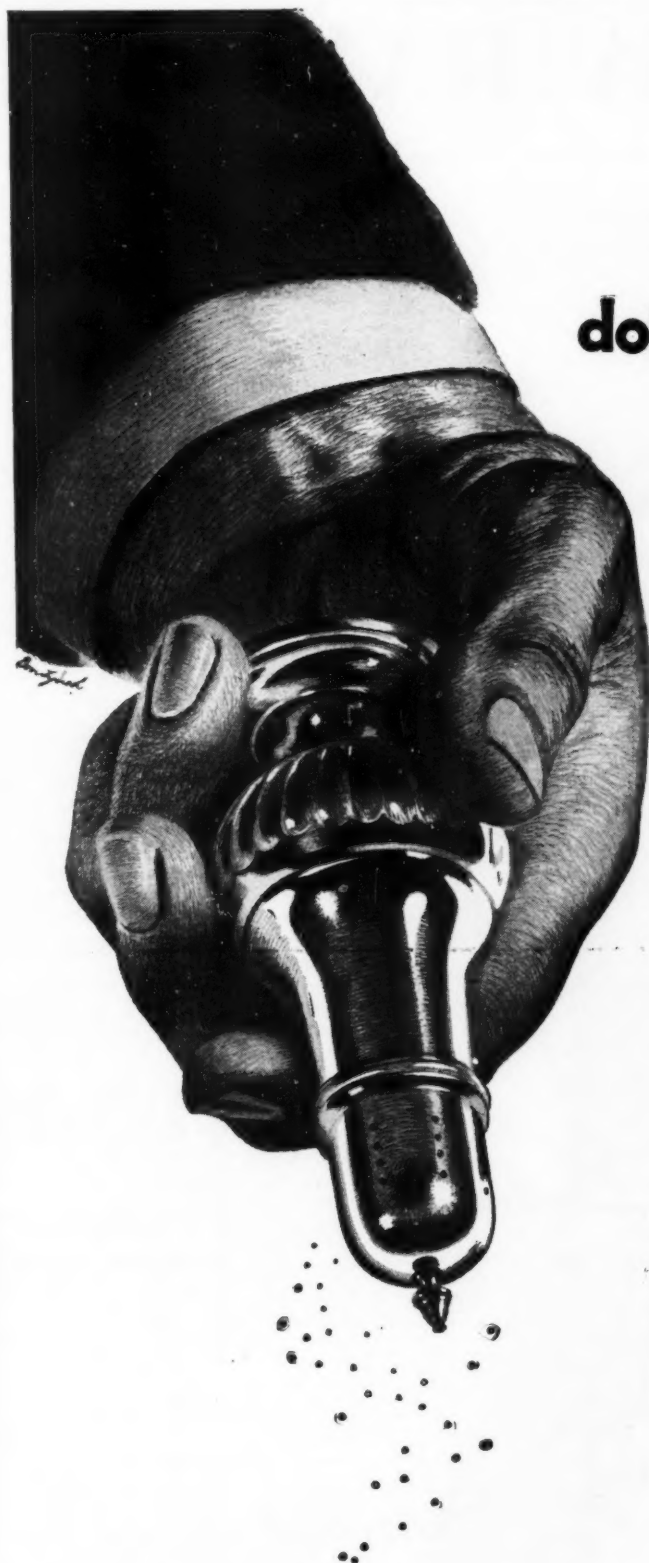
Education and Assistance for Small Forest Owners—Ralph Unger, New York College of Forestry.

Timber Management—Clyde S. Martin, Weyerhaeuser Timber Company.

Generally, the coverage of the study and report is along the following lines: (1) 1944 status; (2) legislation and appropriations since 1944; (3) state activities; (4) federal activities; (5) private industry activities; (6) developments in methods, equipment, etc.; (7) financial status of the forestry movement.

Working through the executive committee of the Association of State Foresters, the Forest Progress Committee has invited each state forester to contribute pertinent information regarding conditions in his own state. Subject matter to be covered in the reports from state foresters includes tabulation of outlays and income, general administration, research, extension forestry, protection, state-county-municipal forests and the number of professional and non-professional employees in state organizations. These reports will be directed to George H. Dean, Virginia state forester, who will channel them to the Forest Progress Committee of which he is a member.

In reporting on the work of his committee, Chairman Butler said the survey and report are being initiated with the long-range view of five-year inventories which will be of value to (1) foresters, by pointing up and delineating the weak and strong points of their professional fields; (2) the public, by keeping it currently abreast of progress or lack of progress in the conservation of forest resources, nationally, regionally and by states, and (3) forest agencies, private and public, by providing periodically up-to-date information helpful in the determination of action programs.



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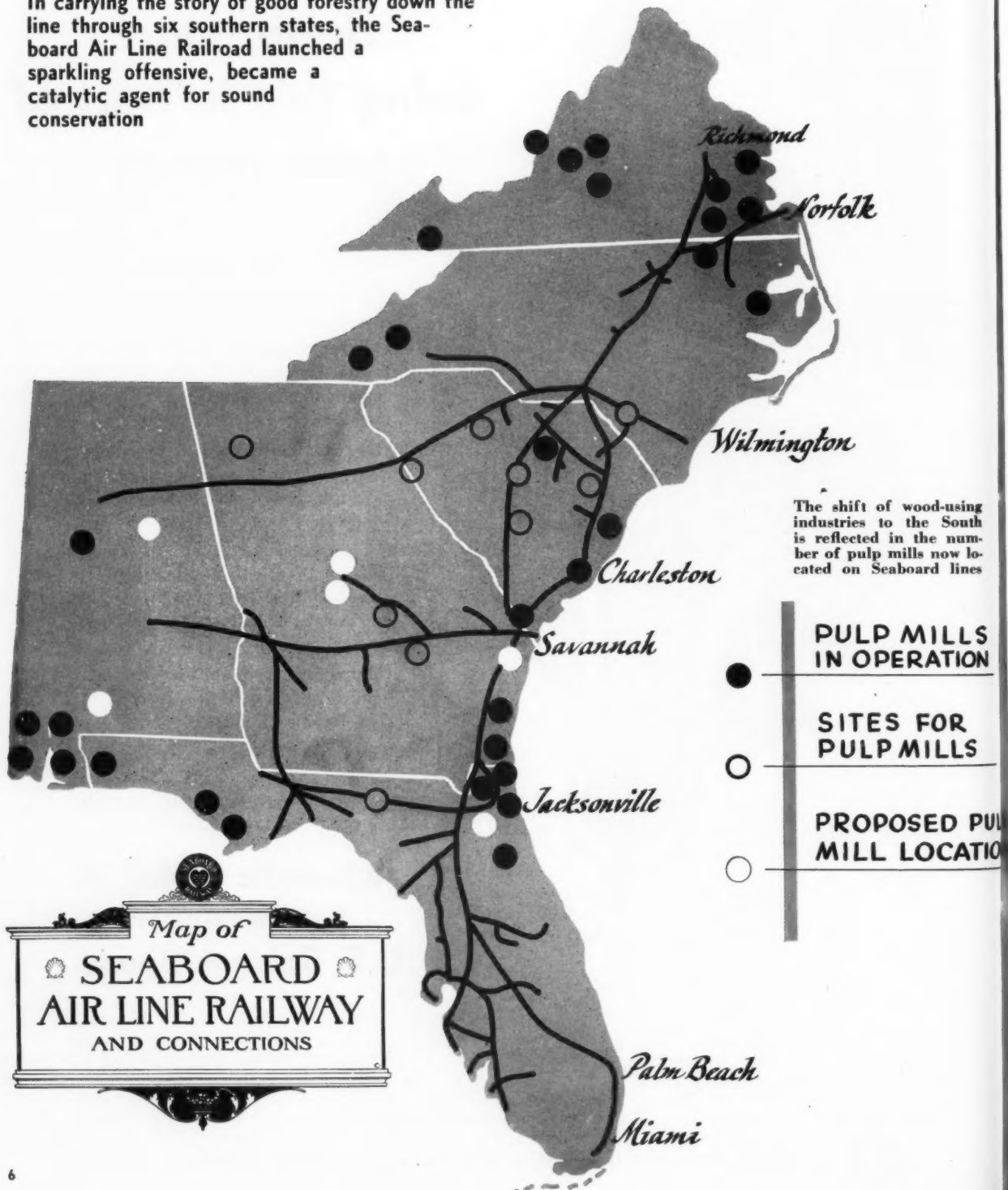
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A RAILROAD

In carrying the story of good forestry down the line through six southern states, the Seaboard Air Line Railroad launched a sparkling offensive, became a catalytic agent for sound conservation



DCrusades for Forestry

By JAMES B. CRAIG

LIKE its own Orange Blossom Special gliding through the heart of Dixie to the land of winter sunshine, the forestry program of the Seaboard Air Line Railroad is a smoothly-gearred conservation express. Its destination is the sunlight of permanent economic stability in the new South.

How this carrier utilized its resources to kindle a spark for sound forestry on its arteries of travel that cut 4150 miles through the great piney woods and hardwood belt of six southeastern states—Virginia, North and South Carolina, Georgia, Florida and Alabama—is a saga of service in the best traditions of railroading.

Seaboard, of course, is not alone among railroads in this concern over the future of forest lands. An increasing number, with mounting interest in forest tonnage, their own wood requirements and community and regional stability and growth, are employing foresters in varying capacities to further overall progress in conservation. But Seaboard took the lead in establishing a forestry division in 1937 and has been in the forefront ever since, mainly in educational and extension work at the landowner level.

"Do everything you can to grow more trees in the territory served by Seaboard," was the substance of the original instructions given A. E. Wackerman, the carrier's first forester, by General Industrial Agent Warren T. White in 1938. The order was repeated again in 1939 when Charles A. Gillett succeeded Mr. Wackerman. It had become a standing order in 1944 when Robert N. Hoskins, present Seaboard forester, reported for work.

There was imagination in the plan devised by Mr. White back in 1937, for in appraising Seaboard's capabilities to exploit their idea they shrewdly banked on a number of factors, some of them concrete and some intangible, but all real and alive.

For instance, there were 18,000 employees in the Seaboard family who could become spokesmen for good forestry from their locations in



Cribbing crossties for air seasoning. This pyramid represents a part of 1,112,000 used yearly to maintain Seaboard's 4150 miles of track

countless cities and hamlets on the system that stretches like fingers through the slash, longleaf and shortleaf and hardwood sectors—an area of over 100 million acres possessing the greatest forest potential in the nation. True, it remained for capable successors to further define and perfect this principle of service—this idea of a wheel within a wheel—but the substance of it was there when the original plan was framed.

Then, too, while Seaboard counted on the good will it would create in sponsoring its forestry program, it also banked heavily on the good will it already enjoyed. For railroads have always been synonymous with service and there are few families whose lives have not been touched by some phase of railroad service. There's a friendly relationship that starts when small boys sneak down to the yards, where the landscape has a swarthy complexion due to the belching smoke from shunting engines, to wave and to be waved at by the jolly engineer with the red bandana around his neck. It continues when men pause in their farm

chores to set their watches by the 7:10's whistle. Yes, railroads even figure intimately in the most poignant moments in the lives of families who cherish the little jokes the conductor made the first time young Tom went away to school and the quiet sympathy of the trainmen who brought back a soldier son from some far-away battleground.

These things form the bedrock on which good relations are formed and Seaboard counted on them and made use of them. Railroads have always been respected members of the communities which they serve. What better catalytic agent could be found to spread the word to heal the earth's wounds, refurbish its ailing forests?

It was this program that first flashed through the South in 1938 which paved the way, to a large degree for subsequent development work by industry. In providing a link between industry action programs and federal and state forestry operations, Seaboard helped to bridge an important gap, set the stage for more concerted effort along a broad front. Cooperation was the theme of these

railroad missionaries and they sought it wherever a train stopped to pick up mail or deliver freight.

Today, the Seaboard Railroad and enlightened elements of southern industry are working shoulder to shoulder with state and federal agencies to reach that vital segment of small woodlot owners who control seventy percent of all forest wealth in the South. This is where the real missionary work must be done and is being done. The goal is to sell these people on the desirability of getting the maximum growth of salable products and the harvesting of those products when they yield the greatest financial return; the importance of planting trees to replace those that have already been cut.

Despite the pessimism still encountered from people for whom industry is eternally on trial, there is cheering evidence that the industrial program of which Seaboard's was the first, is destined to play a major role in helping to lick the South's challenging forestry problems. The bulk of the passengers aboard these conservation specials are the South's most precious asset—its boys and girls. And their passage on these tours of enlightenment is being paid for in large measure out of the pocket of that one-time ogre of the realm—southern industry.

There are southerners, of course, who will tell you that the "South is going to be denuded by the forest products industries in fifteen years." But the evidence they muster to support this contention does not stand up when weighed against the hard-hitting action programs sponsored



Warren T. White—the railroad's forestry program was his idea

by the industries to promote profitable raising of timber as a crop, the swarms of industrial foresters, grown from a handful to several hundred, who are doing a standout job.

Most southerners today, and this includes people who were sharply critical of industry a few years ago say, "Yes, we were apprehensive about the ultimate depletion of our forests a few years back but we think that danger is now past." Tremendous influences are at work in the South to educate people—the small woodlot owners, the producers and the sawmill men—to avert the costly, stupid mistakes of exploitation methods in other regions.

It was a different story fifteen years ago.

Back in the thirties, no organization was more apprehensive for the

future of southern forests than the Seaboard Air Line Railroad. The fact that sixteen percent of this carrier's total freight revenue from carload traffic comes from forest products and manufactures therefrom was one reason for this concern. Another is spelled out in the 1,112,000 cross-ties, 3,000,000 board feet of switch ties, 211,000 linear feet of piling, 14,600,000 board feet of lumber and 4000 signal poles required yearly for maintenance of the Seaboard system.

Railroads have always run on wood, as Forester Hoskins will tell you, and despite the preservative treatment that has increased the life of cross-ties and other maintenance equipment by about fifty percent, Class I railroads in the United States—with over 200,000 miles of track—in 1947 found it necessary to replace 40,205,000 of the 992,648,000 cross-ties in all lines from Maine to California. In all, American railroads used 2,326,000,000 board feet of lumber in 1947. Revenue from forest products freight hauled was over \$450,000,000, or 6.6 percent of the revenue received for the hauling of all commodities—ample proof of the tremendous stake railroads have in forestry.

In a sense Seaboard was caught up in the web of its own initiative back in the twenties and early thirties. With the major shift of industry to the new land of promise, the carrier worked diligently and with considerable success to help locate new wood-using plants along its line. Other southern railroads and chambers of commerce scattered throughout the Southland achieved equal success until there were approximately fifty such plants in operation.

Admittedly this was progress of a high order but it created a brand new set of problems. Back in 1933 between ten and fifteen pulp mills in the entire South had required a daily production of a mere 3000 tons. Now, with great suddenness, there were fifty busy mills and feeding the required amount of pulpwood into the hungry maws of these plants last year required upwards of ten million cords—or more than enough cordwood, if placed end to end, to reach to Tokyo and back. On the hardwood side of the picture, thousands of little sawmills (there are 5000 in the state of Virginia alone) were turning out more and more lumber to meet the demands of this new industrial colossus.

Now it should be borne in mind



Working with youth groups is one of Forester Bob Hoskins' key jobs

that the South, under proper woodland management, can supply an almost unlimited supply of wood from properly stocked stands. But back in the thirties, many small woodlot owners, hungering for the crisp greenbacks pouring from the front offices of the mills for woodpulp and lumber, stripped their farms with careless abandon with no thought of the future—no thought of putting anything back. A full-fledged forest wrecking operation was soon in full swing.

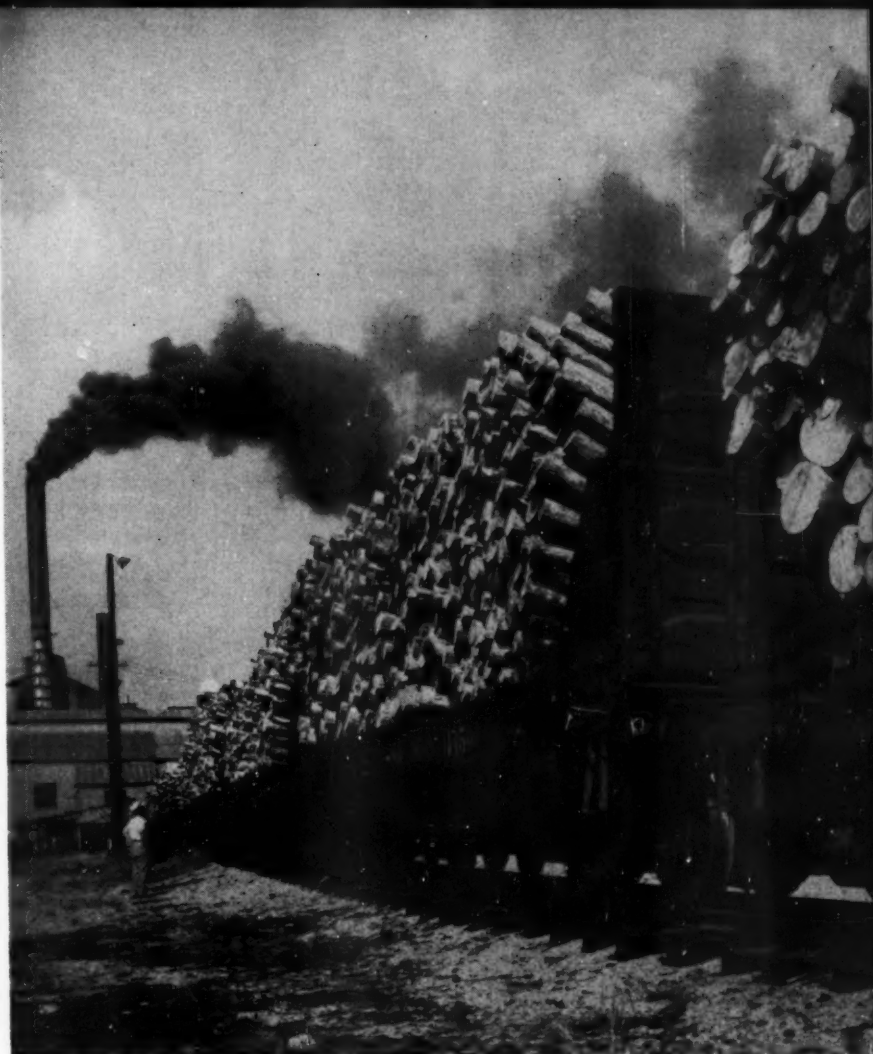
Obviously, education—and lots of it—was required and quickly.

It was about this time that Seaboard's general industrial agent, Warren T. White, a South Carolinian by birth, put on his thinking cap to evolve a plan to help check disastrous cutting and still maintain an adequate supply of timber for wood-using industries on which Seaboard depends for tonnage.

After searching, study and consultations with such men as Dr. Charles Herty, Mr. White concluded that "timber is a crop," built his proposed action program along lines that would develop this concept, and presented it to G. B. Rice, vice-president of Seaboard who gave his prompt approval.

Since agricultural agents had for years been successfully used to correlate railroad and farm activity to mutual advantage, Seaboard followed the inescapable analogy and became the first to employ a full-time forester to serve in a strictly forestry capacity. At that time, many Class I railroads had foresters whose duties pertained to the acquisition or production of forest products for the carrier's own use. The Seaboard forester was to devote his efforts to serving those industries that had invested millions in new plants and employed thousands of local people. He was also to work with any and all agencies ready to help, or already helping to grow more trees, including the state forestry setups, that shoulder the major portion of the load, extension groups, schools and civic organizations.

In the early stages of its industrial forestry operations, Mr. Wackerman, Seaboard's first forester, conducted demonstrations of good cutting practices and cooperated with the lumber and pulp and paper mills in setting up their own forestry organizations and fire control programs. This work was expanded in 1939 by Mr. Gillett, now director of American Forest Products Industries.



Pulpwood en route to the mill. Fifty pulp mills in the South today require upwards of ten million cords of wood each year

Mr. Gillett found that in 1939 the best-made management plans were continually disrupted by damaging fires, a major curse of southern forestry. To combat this menace he took a special Forest Fire Prevention Train through the entire South. For fifty-nine straight days this train, a symbol for fire prevention if there ever was one, made stops at every crossroad. Thousands of people flocked to see it.

It was a backbreaking job but it got results. Billed as a major production along circus lines, the appearance of the train was preceded and followed by countrywide campaigns including exhibits, and essay and poster contests for fire prevention that helped to cement friendships with state agencies and helped to pull all groups together for a more concerted effort.

When Dallas T. Daily succeeded Mr. White as general industrial agent

in 1944, he continued the former's policies, but looking deeply into the forestry future evolved a double-barreled program to carry on demonstration and contact work with the adult farmer and landowner and also extend the line's sphere of activity with youth groups.

Mr. Daily surrounded himself with a young, energetic staff and to fill the post vacated by Mr. Gillett when he moved to Washington, he brought in from Florida, Forester Robert N. Hoskins.

"Bob had excellent contacts with vocational agriculture people in Florida and after coming to Seaboard he soon expanded this circle of contacts," Mr. Daily said. "The result was the first railroad-sponsored farm youth program in America worked out with the Future Farmers of America and with the help of the Southern Pulpwood Conservation

(Turn to page 38)

Land Use—Key to Our Water Problems

Will our epic of land use be another tawdry story of too little and too late—another case of putting the cart before the horse? Or will resource engineers move to correlate both watershed and waterway needs—hitched together to gain maximum effectiveness

By BERNARD FRANK and ANTHONY NETBOY

AS you drive on U. S. 1 for a winter's vacation on the Florida beaches, you pass, thirty miles south of the District of Columbia, a place named Dumfries. If you stop to look around, you can see a couple of filling stations, tourist cabins, three stores, a church, school, small hotel, and several score houses. Dumfries is as undistinguished as thousands of other villages on the busy route to the Southland.

Yet it is a symbol not only of a civilization that has long since vanished but is a monument to our prodigious

waste and abuse of our land.

The settlement of Dumfries can be traced back at least to 1690, although it was not until 1749 that the General Assembly of the Colony of Virginia authorized the establishment of the town. In time, it became the largest tobacco mart in northern Virginia.

Situated on steadily-flowing Quantico Creek, which emptied into the wide Potomac, Dumfries in the middle of the eighteenth century was a busy port. Great hogsheads of the valuable leaf were brought down




B. C. McLean, SCS

Bleak, abandoned farmsteads, like this one in Oklahoma, dot the dust bowl area. Land cleared for agriculture was left unprotected and exposed to wind erosion

from the plantations on the Piedmont and as far as the Shenandoah Valley for overseas shipment. Large vessels sailed up Quantico Creek to take on cargoes for England, the continent of Europe, and other places. Sharp businessmen persuaded their friends to buy property in the booming town, and rich landowners like George Washington, George Mason and Richard Henry Lee came here frequently to attend court—Dumfries became the seat of Prince William County in 1762—and enjoy the amenities of a sophisticated civilization. There were public warehouses, a brickyard, shipyard, five inns, a newspaper, an academy, theater, race track and jockey club.

But about the time of the Revolution the prospects of Dumfries began to recede, mainly because its commercial existence was linked with a crop which draws heavily on soil

Photo by Herrin F. Culver, SCS



This is good land use! Mindful of a giant thumbprint, young trees on the contour in Ohio's Muskingum Valley are the trademark of resource engineers who know that all land planning must take account of both watershed and waterway needs

nutrients and, if grown every year on the same fields, brings on widespread erosion. The washing down of silt from tobacco lands eventually choked up Quantico Creek. The residents of Dumfries tried to establish another town downstream but with little success. A canal was built from the Potomac up to Dumfries, but it was filled with sand in a great storm.

By 1800 the town, like the creek, had dried up. Wharves and warehouses were abandoned. In 1822 the county seat was moved elsewhere, and in 1837 a fire destroyed many of the remaining buildings.

Today Dumfries is a "bedroom town" of a few hundred residents, most of whom work elsewhere. There is nothing left of its Colonial glory except a decrepit inn and a weather-beaten, crumbling building that once served as the office of the governor's tobacco inspector. Quantico Creek is

now hardly visible to the passing motorist.

I

The general pattern of land exploitation in the United States has been one of trial and error, use and exhaustion, leaving much abandoned or ruined acreage and many stranded communities like Dumfries in its wake. In a report to the Secretary of Agriculture in 1941, Milton S. Eisen-

hower, then land-use coordinator, summarized it well: "In most local areas, land use has changed many times. As new lands opened on the westward march, as federal land policies changed, as new crops found their place in the scheme of production, and as technological developments revolutionized methods of production, the character of land use changed, and changed again. . . A Georgia county began with self-

This is the second of a series of three articles by Bernard Frank and Anthony Netboy dealing with the dangers of piecemeal planning in solving our land and water problems. The first, "Dams are Not Enough," appeared in January. The concluding article, "The Mirage of River Basin Development," will be published in the March issue. Mr. Frank is Assistant Chief of the Division of Forest Influences of the U. S. Forest Service. Mr. Netboy is a well-known editor and writer.

sufficiency, changed to cotton, then partly to dairying, back to cotton, then to peanuts, and finally back to the beginning—self-sufficiency.

"A Missouri county depended on its forest farming until the timber supply was exhausted, then tried cash crops, failed, and is now trying a combination of self-sufficiency, farm forestry, and recreational development. A Colorado county, opened under the Homestead Act, tried cash grain until the dry years came, then half the population fled as dust storms raged, and now the remaining farmers are attempting to turn to grass and livestock. And an Oregon county began with forest liquidation, grazing and cash cropping, which produced a good income until the timber supply was gone; now it is attempting to reforest, extend the grazing lands, contract the cultivated lands."

While the nation was expanding and undeveloped lands were available beyond the frontier, the effects of soil, timber, and range depletion were obscured by good prices for farm, ranch and forest products. But when the frontier disappeared and the pinch in land and water resources began to be felt, national stocktaking was inevitable.

The first attempt to make an inventory of the nation's natural resources was that of the National Conservation Commission appointed by President Theodore Roosevelt in 1908. Its report revealed, for example, the extent of forest depletion. Each year, for forty years, on the average, forest fires had killed fifty people and destroyed \$50,000,000 worth of timber. Reckless logging methods had wasted one fourth of the standing timber on the areas involved. The rudimentary system of turpentine longleaf pine in the South had killed one fifth of the trees worked.

The commission also found that forest denudation or abuse had brought serious injury to many of our watersheds. Steep forested headwater areas that should have been protected against fire, heavy grazing, and overcutting, were severely damaged. Streambanks that had been firmly stabilized by vegetation were now cutting away, causing the loss of valuable bottomlands and releasing large quantities of sediment. Precious organic matter had been

destroyed, and humus-enriched topsoil, that took many years to develop, was impaired.

Much of the land cleared for agriculture had been used only for a few years, then was left exposed to the destructive forces of wind and uncontrolled water.

A national investigation of the grazing lands was not made until 1935. The U. S. Forest Service, at the request of Congress, submitted an exhaustive report in 1936 on the 728 million acres of western range which produced seventy-five percent of the nation's wool, fifty-five percent of the sheep and lambs, and about one third of the cattle and calves.

This grassland domain had been treated as unmercifully as our forest empire. More than half the forage on the entire western range was gone. Only about ninety-five million acres were still in reasonably satisfactory condition. About 590 million acres were eroding more or less seriously, thus reducing soil productivity and impairing watershed ser-

vices. Three fifths of this area was adding to the silt load of the major western streams. The Forest Service concluded at that time that it would require probably "more than fifty years of management to restore the depleted range sufficiently to carry even the 17.3 million livestock units [then] grazed, and probably an additional fifty years to restore it to the nearest possible approach to its original grazing capacity of 22.5 million units." More recent events indicate that these findings were much too optimistic.

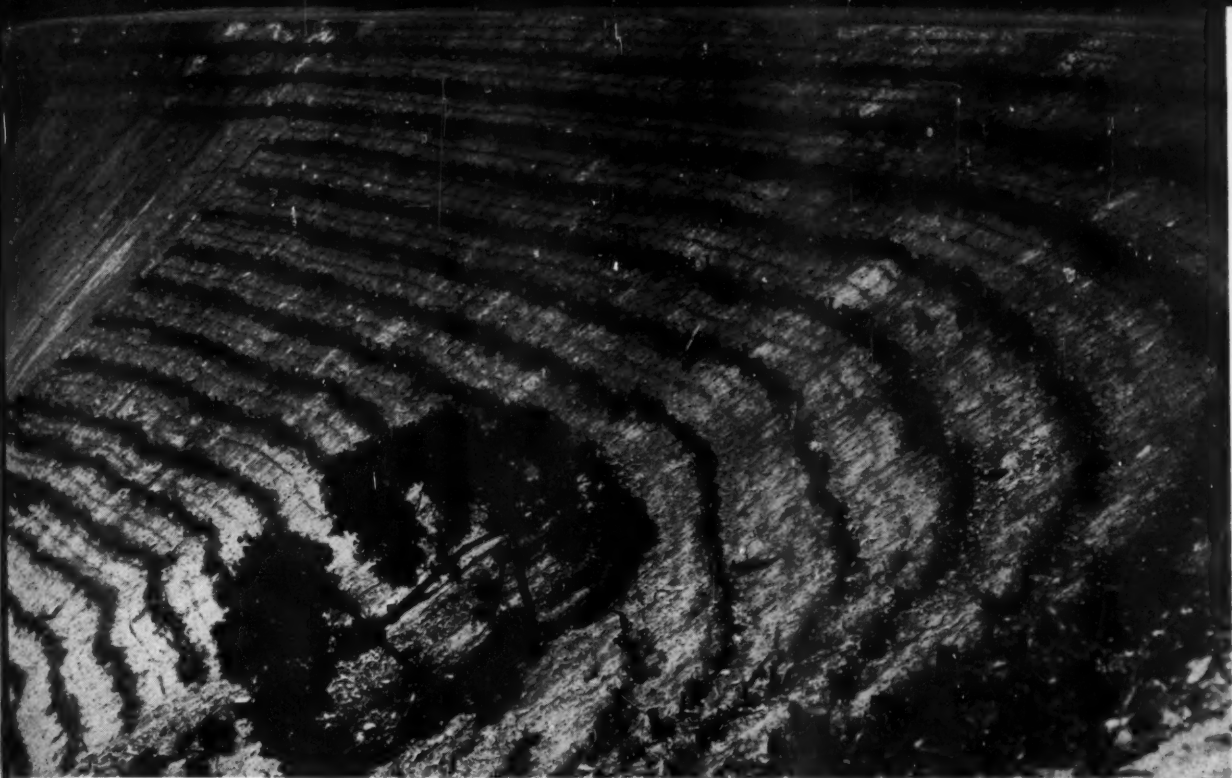
II

For over 200 years the trend in land use was that of unchecked exploitation and waste. Although there were far-sighted farmers—such as Washington, Jefferson, and others—in the latter eighteenth century who practiced and preached a type of husbandry that would meet with the approval of modern soil conservationists, their influence was negligible. In the early and middle nine-



This was once a busy office in now quiet Dumfries, Virginia. Trade died when silt clogged creek to shipping

Washington Post photo



U. S. Forest Service

A planting project designed to control soil erosion along a highway in the Angeles National Forest, California

teenth century, practical tests were made, usually by men with scientific training, of the methods that could be effective in stabilizing soils, improving the cover, and repairing watershed damage, but their findings went unheeded except by a few farmers.

A full-fledged Department of Agriculture was not created until 1889, when modest investigative and educational work was launched. The majority of American farmers at that time were using husbandry methods scarcely better than in the Middle Ages, and men were destroying in the name of commerce the forests, ranges, and bounteous wildlife with frenetic abandonment.

A true conservation movement arose first in connection with our forest lands. But many of the earliest forest conservationists were dominated by the fixed idea that denuded watersheds could be rehabilitated merely by planting trees. It was only gradually that the concept of forest management as a vital principle of land use was grasped.

The turning of the tide from exploitation to conservation to an appreciable extent was marked by the creation of the forest reserves—later called the national forests—and the development of a strong U. S. Forest Service early in the twentieth century. The early national forests were established for watershed protection

as much as for anything else. Passage of the Weeks Law in 1911, authorizing the federal government to purchase private forest tracts on the headwaters of navigable streams, and cooperate with the states in protecting from fire headwater forest areas in private and state ownership, was another step in the right direction.

The soil conservation movement lagged behind forest conservation by about forty years. But once started, it gained swift momentum. By 1948, more than three fourths of the billion acres comprising the six million farms and ranches in the United States were included within the borders of 2000 state soil conservation districts. For about one fifth of this acreage the Soil Conservation Service had prepared conservation plans. But how far these plans have been carried out, and how many of the improvements have been maintained, we actually do not know. Studies have shown that even within soil conservation districts sizable proportions of the farmers do not actually participate in the program, and many of those who do, favor quick cash-producing practices at the expense of soil depletion.

Conservation practices have also been stimulated by federal benefit payments to farmers—running into a few hundred million dollars annually—under the agricultural conservation program. These practices on the

whole are probably less effective than the work carried out under the technical aegis of the Soil Conservation Service.

III

The great hope in saving our soil and water resources is to propagate the principles of watershed management, that is, use the land for timber, forage, or crop production in such a manner as to maintain the health of the soil, thus assuring its stability and effective functioning as nature's great water storage reservoir.

Proper care of the land means more abundant usable water, better distributed streamflow, more ground water, and better quality water. But the fact that good land and good water go together has not sunk into the national consciousness—principally because the close relationship of water to the condition and use of the land has not been sufficiently understood to produce the necessary effort to solve our intrinsic water problems effectively.

Watershed management is beset with difficulties. In a recent report on the state of the nation's forest lands, the Chief of the U. S. Forest Service remarked that "public apathy and a lack of understanding is a potent obstacle. For the most part, people are unaware of serious watershed situations even after floods or other

calamities occur. Little is done about them because the public does not understand the cause or . . . cure or is not sufficiently aroused to demand action.

"Inadequate knowledge also hampers watershed protection. . . . Land managers have much to learn about how timber cutting, grazing, and other uses may be harmonized with watershed services. . . . They need a working knowledge of the economics of watershed management, and techniques for maintaining water supplies, stabilizing soil, and controlling runoff. It will take greatly strengthened research to provide all this."

Correctives of watershed difficulties have continually broadened in scope, as in the advance in the engineering field from reliance on levees only to a system of multipurpose reservoirs strategically planted over entire drainage systems. But even the Tennessee Valley Authority program, thus far the only large-scale unified experiment in river control and use,

thermore, programs financed by public agencies must take into consideration the sharp division between private and public lands.

IV

A promising beginning in the direction of saving our watersheds is the flood control work of the federal government and the comprehensive pollution control activities of such agencies as the Interstate Commissions on the Delaware and Potomac River Basins. Corrective measures on a small river-basin scale—as in the Brandywine Valley described in a recent issue of *American Forests*—are also being undertaken by groups of landowners, a few watershed-owning municipalities and waterworks companies, and scattered groups of soil conservation districts.

The most important—and largest in scope—of these activities are the programs undertaken by the Department of Agriculture, under the Omnibus Flood Control Act of 1936 and

York, Coosa River in Georgia and Tennessee, the Little Sioux in Iowa and Minnesota, the Los Angeles and Santa Ynez rivers in California, the middle Colorado and upper Trinity in Texas, the Potomac in Virginia, Maryland, West Virginia, and Pennsylvania, the Tallahatchie and other tributaries of the Yazoo in Mississippi, and the Washita in Oklahoma and Texas.

The Department of Agriculture's action programs, when completed—and provided they are adequately maintained—will also result in cleaner streamflow and augmented ground water supplies, with consequent gains to recreation opportunities, desirable fish and wildlife population, and benefits to domestic, industrial, and agricultural water users generally.

Illustrative is the program underway on the 839-square-mile Los Angeles River drainage—a situation which has required urgent correction. The job was first tackled on the mountainous Arroyo Seco sub-watershed, and in the rich San Fernando Valley.

The major features of the mountain work involve the use of helicopters, water tanks, radios and other new and intensive fire prevention and suppression devices and practices; the construction of debris catchment barriers; plantings across the bottoms and side slopes of the main canyon and its tributaries; and building of structures designed to prevent slides and keep water and eroded materials off roads and highways. Trees are to be planted on thinned-out spots, and slopes denuded of cover reseeded to grass and other suitable plants.

The San Fernando Valley, abounding with orchards and grain fields, is being terraced, contour-plowed, and planted with cover crops. Irrigation works are to be redesigned to minimize soil washing on sloping fields. Livestock grazing is to be carefully controlled, and soil-stabilizing species will be planted along the small waterways to halt bank-cutting.

Cost of the program, estimated in 1941 at \$11,400,000 to be spent over a ten-year period, is shared by the federal government with the State of California, the Los Angeles and Ventura county governments, the City of Glendale, and cooperating landowners. Annual maintenance costs were expected to average \$500,000, of which fifty-four percent was to be assumed by the federal government, ten percent by state and local governments, and thirty-six percent by landowners.

(Turn to page 36)



This study of good and bad grazing practices tells its own story of productivity on the left of the fence and barrenness on the right

does not yet embody (as we shall see in the next article) the concept of watershed management. However, among agronomists, foresters, soil conservationists, hydrologists, and land economists, increasing weight is being given to the watershed aspects of river basin planning. Since the watershed is a synthesis of the natural factors which underlie the effective utilization of land, it constitutes perhaps the soundest basis for solving the complex and interrelated problems growing out of human occupancy and activity.

But many obstacles must be overcome if conservation efforts are to be redirected along watershed lines. For example, political boundaries rarely coincide with the natural boundaries of a river basin; hence any attempt to tackle a sizable area must take cognizance of state, county and other local governments. Fur-

subsequent legislation, in cooperation with state and local bodies.

By the end of 1948, the department had made preliminary investigations of flood damages and their causes on 164 watersheds covering about 1,700,000 square miles in every region of the United States, and had completed detailed investigations—and made recommendations for or against remedial action—on eighteen watersheds, including the Missouri River Basin, totaling about 600,000 square miles.

On eleven areas multipurpose watershed flood control programs have been approved by Congress and projects are in various stages of completion. They are designed basically to retard flood-producing runoff and check erosion and debris movement at their source. The projects are being carried out on all or parts of the watersheds of Buffalo Creek in New



DAMS

VS.

SILT

Within a Sunday afternoon's drive from nearly any point in the United States one can find a dam being rendered useless by deposits of silt. The problem is widespread. The pictures on this page are typical of conditions mentioned by Bernard Frank and Anthony Netboy in this series of articles. Above was Lake Como at Hokah, Minnesota, in 1926 when it was a busy summer resort and site of several flour mills. By 1936 the lake had become a swamp with a small, muddy stream flowing through its center (as shown below). The Soil Conservation Service reports nearly 2000 small reservoirs have suffered similar fates—the result of poor land-use practices on the watershed, plus the lack of corrective measures on the dams and reservoirs. The damage amounts to more than \$50,000,000 a year





Jelly Elliott and the Three Knotheads—their crusade against man-caused forest fires is reaching folks “up the hollow”



The evolution of Jelly Elliott and his Three Knotheads, the unusual radio aggregation that is giving the forest fire prevention campaign a new twist in the Southland, is proof of the fact that research pays off.

When experts from the Advertising Council, the organization that sponsors the Cooperative Forest Fire Prevention Campaign, went to Louisiana last year to determine why their message wasn't reaching the folks “up the hollow,” they had never heard of Jelly. Nor had they ever heard of the Three Knotheads. But their ten-day trek in back-country areas, arranged for them by State Forester Jim Mixon and Assistant State Forester Jim Kitchens, soon changed all that.

Investigation by Henry Wehde, Jr., staff manager of the council, and Clint Davis, director of the Fire Pre-

vention Campaign, quickly showed why the council's campaign publications were failing to reach these individualistic back-country people. With the exception of the Bible and a few other stock publications, they simply don't read.

But all of them are good listeners. When it was noted that practically every shack nestled among the pines had radio aerials on their shake rooftops, inquiries showed that the radio entertainer who enjoyed the biggest Hooper rating up the hollows was a homespun philosopher, Jelly Elliott by name, who also sang pleasing ballads and strummed a three-string bull fiddle.

Ordinarily taciturn country people waxed eloquent in praising Jelly's excellent qualities. Practically everybody listened to him. Most folks swore by him. Like themselves, he was a self-professed "pore country boy" albeit plenty sharp in the clinches. And his endless patter of cracker box philosophy was well-laced with hymns and hoedowns rendered by the Knotheads, a better-than-average hill-billy band including Deacon Anderson, a first-rate steel guitar player, Slim Watts, rhythm guitarist, and Robert Shivers, a fiddler who allegedly earned his instrument by selling garden seed across the country.

Would Jelly consider doing a series of programs to help check appalling forest fire losses in the nation—losses that exceeded \$30,000,000



Late night sessions were required to record the fire prevention series. Listening to a playback above to make a content and quality check are Jelly, and Technicians Win Adams, Jim Kitchens and Bill Bergoffen



But when work was done all hands went to Jelly's shack on the Neches River for a fish fry. Clint Davis, of the Forest Service, was roped in as chief fryer. Jelly (in jungle suit) and Mrs. Elliott assisted



in 1948? Probably not, most folks opined. When not fishing or hunting, Jelly was kept more than busy plugging hatcheries, baby chicks, farm implements and used cars on his program emanating from Station KALB, Alexandria, Louisiana, and Station KTRM in Beaumont, Texas. Once asked when he was going to come back to work in the midst of a prolonged vacation, Jelly drawled, "Jest as soon as the fish stop abitin'."

As it turned out, Jelly was not too busy to "give the government a hand." He showed immediate interest in the setup of the Cooperative Forest Fire Prevention Campaign for the states and the federal Forest Service, remarked philosophically, "Everybody loves the woods. It's funny but it's true. I guess it's the animal instinct in us."

◀ When not selling chicks, coffee and forest fire prevention, Jelly teaches Toby—his trained mule—new tricks for their minstrel act

With the inauguration of Jelly's show last month, eventually to be heard by some 500 stations in twenty-five states, it immediately became apparent why Yale boys had previously struck out in their efforts to sell the folks up the hollow.

"Let's get acquainted, folks," Jelly remarked easily as his aggregation came on the air with their theme song "Cowcall" and an assortment of whoops and related noises. "Come in and set a while. You may not like this mess to start with but take a chaw of tobaccer, spit on the stove, take off your shoes and maybe you'll grow into it."

After two interesting arrangements of "Boil 'Em Cabbage Down" and "Milk Cow Blues," Jelly talked about the woods briefly and how they can "pleasure people, providing fires don't mess everything up." Listeners were next advised to "get out yore weepin' rags and get ready to squall

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Forests in the Desert

High in southern Arizona's seven great mountain ranges lies a cluster of cool, green oases. Here is the secret of their unexpected beauty

DOWN across the scorching deserts of southern Arizona is a cluster of cool forest oases 500 square miles in extent. Just north of the Mexican border, where only cactus, rattlesnakes, gila monsters and leather-skinned old-timers are supposed to survive, are miles of shaded roads and trails through pine, fir, spruce and aspen woods. There are wildflower meadows, too, moist fern-brakes, fishing streams and hushed campsites where you can hear the twilight song of the hermit thrush.

The secret of these forests in the desert is altitude. In the southeastern corner of Arizona, from the Mexican line to the Gila River, seven great mountain ranges hump their broad backs out of the desert into a cooler year-round climate than Toronto, Ontario. If you flew in a jet plane from Mexico to Canada in ninety minutes, your trip would make headlines. But with your own car in southeastern Arizona you can tra-

By WELDON F. HEALD

verse in an hour and a quarter the same differences in climate, vegetation and animal life that you would encounter on a 2000-mile journey northward.

These seven ranges, together with many lesser ones, stretch north and south through an area almost as large as New Hampshire and Vermont combined. The region is bounded on the south by the Mexican border for 115 miles between the New Mexico line and Nogales, and extends 140 miles northward to the Gila at Florence. The ranges stand at respectful distances from each other, leaving between them broad desert valleys and wide-sweeping, mile-high, grassy plateaus.

Twenty to thirty miles long and arching into the blue southwestern sky to heights of 7500 to nearly 11,000 feet, the ranges resemble isolated, green, forested islands rising

out of a sea of waving grass and desert shrubs. These mountain oases show similar family characteristics, but each has a personality distinct from its neighbors.

The Santa Catalina Mountains are the best known of the seven ranges, and are the most easily reached. They form a lofty and picturesque backdrop directly north of busy Tucson, southeastern Arizona's winter tourist capital. Roughly triangular, twenty miles to a side, the Santa Catalinas rise from a base about 3000 feet and culminate in the round, forested summit of Mount Lemmon, 9180 feet. There is no better introduction to the contrasts and far-flung horizons of southeastern Arizona than a drive up the paved, forty-mile highway from Tucson to the skyline ridge of the Santa Catalina Mountains.

Forrest Shreve in his detailed monograph, *Vegetation of a Desert Range as Conditioned by Climatic Factors*, says of Mount Lemmon: "There is no portion of the mountain, at least below 7500 feet, in which a climb of 500 feet does not alter the physiognomy of the surrounding vegetation." This is literally true, for as your car winds up the mountain the changes are almost kaleidoscopic, the temperature drops perceptibly, and your destination among the pines, firs and aspens gives you the sensation of visiting another world.

Tucson is in a desert basin and, as you drive towards the mountains, the stony plain bristles with the weird, branched columns of the saguaro cactus, prickly cholla and creosote bush. Along the dry washes are cottonwoods, willows and mesquites. Desert flora extends up the south slopes to 4000 feet.

The oak and grass belt is exten-

The Santa Catalina Mountains form a picturesque backdrop to the desert

McVey, Western Ways





Weldon F. Heald

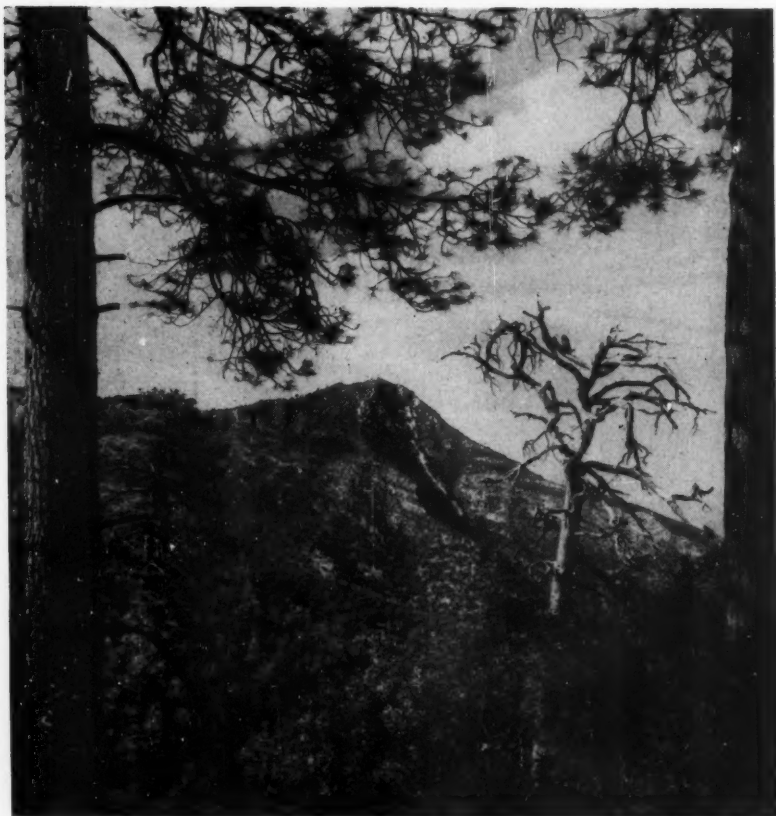
In the distance is 8406-foot high Huachuca Peak, framed in the ponderosa pine and Douglasfir of the mountain forest

sive between 4000 and 6000 feet throughout the entire region, and around the bases of the mountains it forms some of the Southwest's finest cattle range. Emory and Arizona white oaks are the two predominant species; they are not quite evergreen, there being two to three weeks in April when they shed and replace their leaves.

A straggler down into the oak belt, and usually the first conifer you see, is the alligator juniper which ranges between extremes of 5000 and 8500 feet. Its foliage runs to light blue

rather than green and its bark has the checkered appearance of a crocodilian reptile. Usually medium-sized, several of these junipers in Chiricahua National Monument, eighty-five miles southeast of Mount Lemmon, are six feet through the trunks and fully seventy feet tall. The juniper-pinyon partnership found further north is not well developed in southern Arizona. But stocky, tough, contorted little pinyon pines are scattered up the dry, rocky slopes from the middle of the oak belt to the coniferous forests above.

The road crosses a broad spur from Soldier Canyon to Bear Canyon. The air becomes cooler and the mountains rise higher above you. Here, at 5500 feet, are groups of Arizona cypress, one of the Southwest's most distinctive conifers. With their sprays of long, up-pointing branches, blue-green foliage and their habit of huddling close together, Arizona cypresses can be easily recognized on mountainsides and at the heads of steep canyons from a distance of several miles. Like the juniper, Arizona cypress has its



Herbert, Western Ways

Temperature and vegetation undergo many changes on a climb up Mount Lemmon

finest development in the Chiricahua Mountains where the trunks of veterans measure seven and eight feet through.

The Mount Lemmon highway loops back out of Bear Canyon onto the north wall and ascends the steep face past fantastic granite rock formations to Windy Point. There, at an elevation of almost 7000 feet, a great slice of southern Arizona is suddenly spread out before you: broad valleys stretching southward to Mexico, thousands of acres of desert, grasslands, wrinkled, oak-dotted hills and line upon line of blue mountains to the horizon.

Above Windy Point you top the grade and drive into the pine forest. The cosmopolitan ponderosa pine, which ranges from British Columbia far down into Mexico, forms the bulk of the forest. But in this southern region it has a trio of close relatives which dendrologists have recently decided to separate into distinct species. They are the Arizona and Apache pines, distinguishable from their famous relation only by experts, and the more distant Chihuahua pine which resembles an impoverished ponderosa with short

needles and a host of small cones.

A five-needle pine, having a slightly higher altitudinal range, is the Mexican white. When small it looks like a California sugar pine, but in maturity its blackish bark and tufted foliage reminds one of the Eastern white pine. Among the lower conifers are scattered Texas and Arizona madrone, while higher up grow the deciduous Utah white oak and the shrubby, evergreen netleaf oak which forms dense thickets on open, south-facing slopes. Along forest streams are alders, maples and box elders.

As you drive higher the Douglas-fir appears, then the white fir. These two, with Mexican white pine, make extensive, dense, somber forests above 7500 feet on the north sides of all seven of the major ranges. Wandering among these moist fir woods gives you the feel of being in Oregon or the Sierra Nevada, and yet from openings you may catch glimpses of the tawny, barren desert below, shimmering in brilliant sunlight. The Douglasfirs, however, do not quite grow to Oregonian size, but attain trunk diameters of seven to eight feet, and heights of 150 feet.

The Arizona or corkbark fir which

is common above 9000 feet in the Pinaleno and Chiricahua mountains is represented in the Santa Catalinas only by a small colony high up on Mount Lemmon's north slope. Whether this narrow, spiry, graceful tree is a variety of the northern alpine fir or a separate species is still debated by botanists. The feature distinguishing the Arizona version of this tree for the layman is the soft, corky, ash gray bark which differs greatly from all other firs.

Finally, there is the aspen. It grows only above 8000 feet in this southern latitude. White-boled aspens scattered among the evergreens and often forming sizable pure stands are one of the most charming features of these forests in the sky. And in autumn their fluttering lemon yellow and deep golden foliage shines in the sun as if illuminated with inner light.

You will notice that there is an interesting blending of northern flora with that of Mexico in these mountains. This mixture persists through the animal, bird and insect population as well. Here the northern black bear, mountain lion and white-tail deer meet the Mexican mule deer, peccary or wild pig, and the strange anteater-like *coati mundi*. Even Mexican jaguars, ocelots and parrots stray far north of the border.

Furthermore, like islands in the sea, each isolated range has separate varieties and even species of mammals and birds. Thus the Chiricahua Mountains have the Apache squirrel; the Huachuclas, the Huachuca gray squirrel, while in the Santa Rita, Santa Catalina and Pinal ranges, other varieties of gray squirrel are found.

The Mount Lemmon highway ends at the little resort of Summerhaven where, even during the warmest months, you may be glad of the big open fire at the rustic lodge. You have changed your climate in an hour and a half from a place having a July average daytime temperature of 100 degrees with an annual rainfall of eleven inches to one which would probably record seventy-four degrees and nearly forty inches of precipitation.

The Santa Catalinas are within one of the nine separated divisions of Coronado National Forest, with headquarters at Tucson. Along the Mount Lemmon road the U. S. Forest Service has provided several improved campgrounds and two summer homesite areas. There are miles of good trails for hiking or riding in the forests and leading up along

(Turn to page 42)

New York Water Supply: A Long-Range Problem

The need for new untapped sources will remain long after present shortage is over

NEW York City's critical water shortage has started municipal officials and water engineers thinking in terms of the community's future water needs and of the resources available to meet them.

There are two phases of the water problem: first, conditions in the next few years, and second, the long-range problem of supplying water twenty years from now.

New York City's present water supply comes from the Croton and Catskill reservoirs and from wells on Long Island and Staten Island. This system's "dependable yield"—defined as the average daily yield over two consecutive dry summers—is 1045 million gallons of water a day.

The present emergency exists largely because the rainfall since last June has been only a fraction of the normal amount. The following table shows how frequently in 1948 and 1949 rainfall was below normal. The figures refer to the Esopus watershed in the Catskills, but they are typical of the other watersheds.

Month	1949 (in inches)	1948 (in inches)	Normal (in inches)
January	4.95	3.02	3.40
February	2.53	2.19	3.05
March	1.32	5.58	3.85
April	4.57	3.93	4.23
May	5.21	5.16	4.31
June	1.27	5.13	4.54
July	3.73	2.27	4.69
August	4.45	3.42	4.58
September	5.68	1.12	4.50
October	2.31	3.26	4.03
November	2.03*	7.04	4.28
December	9.19	3.45

* Approximate.

The painful truth for city dwellers is that the present situation in all likelihood will continue in greater or less degree until 1956, when the so-called "Delaware project," now under construction, will be finished. The project will tap Rondout Creek, which flows into the Hudson River, and two Delaware River tributaries—the

By **CHARLES G. BENNETT**

East Branch and Neversink Rivers.

This \$440,000,000 project was to have been completed about 1945, and thus would have kept well ahead of New York's water needs. But the war intervened. Now it is probable that the project's total available yield of 440 million gallons daily—540 million gallons with the Rondout Reservoir quota included—combined with existing supplies, will be adequate to keep up with demands for only a few years beyond 1956.

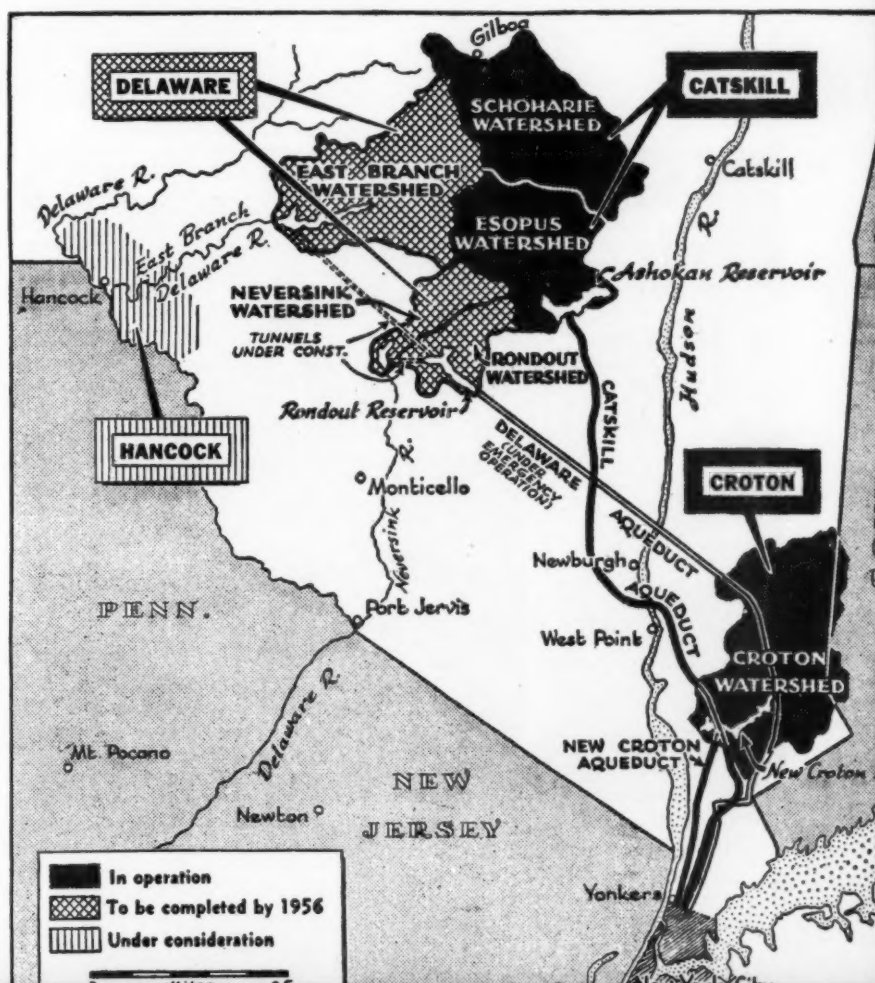
Work on the Delaware project was

authorized by the city in 1928 but was held back because of an action brought by New Jersey in the United States Supreme Court enjoining New York City and State from taking water of any tributaries of the Delaware River.

In May, 1931, the court upheld the city's right to augment its water supply from the headwaters of the Delaware River itself. The city was permitted to divert only 440 million gallons daily from the Delaware tributaries, instead of the 600 mil-

(Turn to page 45)

THE CITY WATER SYSTEM — PRESENT AND PROJECTED



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For a century and a half—ever since it was founded—Los Angeles has had to meet challenging water problems. Here is the beginning of a two-part story of this fascinating history

Water and the City of the Angels

By W. S. ROSECRANS

HIS Majesty, having deigned to determine to alter the provisional Regulations now in force in the Peninsula of California; in order to give due fulfillment to this Sovereign Resolve, has marked (this) as the most suitable means (for their) adoption . . .” so starts the ordinance for the government of the Province of the Californias, often called the Reglamento of Don Felipe de Neve, Governor of California. It was approved by Carlos III, King of Spain, by remote control

on October 24, 1781, through the signature of the Royal Visitador General José de Galvez.

This event took place just fifty days after a little cavalcade of soldiers and settlers had proceeded over a dusty trail from San Gabriel to the Porciuncula River. There with proper prayers and Spanish oratory they had founded a city which came to be called La Ciudad de la Reina de Los Angeles de Porciuncula. And there after proper vivas for the King and Mother Spain, homesites and fields

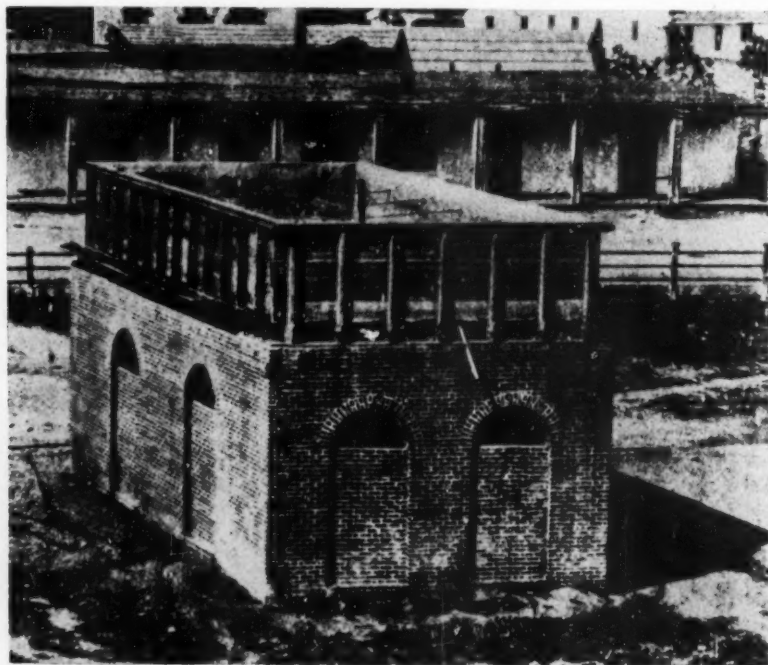
had been assigned to the settlers upon which they were to grow irrigated crops.

De Neve's Reglamento was a very important document. It provided for the soldiers' pay and equipment, the duties and privileges of the officers, the equipment and food allowances for the settlers and gave the general plan for a colonial administration designed to promote the christianization of the savages in a large and sparsely settled country.

The Spanish colonial officials, coming from an arid country, knew the value of water. They had founded the Pueblo of the Angels at the most favorable location on the largest stream in the area. Their judgment was vindicated in the years that followed, as the Porciuncula, later named the Los Angeles River, even in dry years never produced less than 2000 miner's inches until pumps were used in the upper areas to divert it.

To maintain their herds and crops, de Neve's Reglamento gave to the settlers the common privileges of water and pasturage. They were individually to construct proper ditches for the irrigation of their fields. They were also required to construct communal public works, the most important of which were the Mother Ditch, or "Zanja Madre," and a reservoir. The water rights of farmers who dug the ditches were recognized, but were held subject to municipal control.

A very minor section of the Reglamento was of unique importance. It granted to the pueblo the right to all water of the river. This right, unchallenged for almost 100 years, was confirmed by the state legislature in



Original reservoir for the city of Los Angeles was built in the Plaza in 1860, and was used until 1870. This picture was taken in 1865



The building of the Los Angeles aqueduct was accomplished before the day of large trucks. Huge teams of as many as 57 mules were hooked together to transport the sections of steel siphon from the railhead to the point of installation

1850 and 1851 after California had joined the Union. Extensive litigation developed, however, in 1880, lasting many years. Nevertheless, the city prevailed and its water rights remained unimpaired.

The importance of this water source based on usage and Spanish and American law may be better appreciated when it is remembered that it was the sole supply of the city until the completion of the Owens River aqueduct in 1913. It still provides. From its underground sources is pumped a sufficient supply of water for a population of from 300,000 to 500,000.

The extreme aridity of southern California's climate is not immediately evident to the newly arrived resident or tourist. The luxuriant subtropical vegetation of the cultivated areas, in sharp contrast to the deserts east of the mountains, gives the impression of abundant rainfall. It is, however, soon realized that this vegetation is continuously dependent upon frequent and regular irrigation.

In the main, southern California is an artificially created oasis bounded in general by deserts of more or less complete sterility.

It derives a limited and variable water supply from the steep, rocky and sparsely covered mountains surrounding the area. The extreme precipitousness of these is graphically illustrated by the fact that from the top of Mount San Antonio, 10,500 feet in altitude, to the ocean is just thirty-six miles. On the mountains the precipitation averages thirty inches, but

this rate decreases to about fifteen inches at Los Angeles and about ten inches along the coast. These average figures may, however, be misleading, as during wet years large portions of the precipitation are lost as flood waters flowing into the Pacific, with never a steady rainfall to make constant flows of water in the canyon streams.

Annual rainfall varies greatly in southern California; about half the years are termed dry and the others wet. Perhaps once in twenty years

The Author

W. S. Rosecrans, Chairman of the California State Board of Forestry, and former President of The American Forestry Association, has been prominently identified with conservation interests in Southern California for many years. Keenly interested in water problems, one of his most important efforts has been as Chairman of the Flood Control and Conservation Committee of the Los Angeles Chamber of Commerce.



comes a real flood. Storms even in dry years may be torrential in character. There are no years of normal rainfall—each is either “unusually” dry or wet.

Because of steep terrain there is an extreme scarcity of surface water storage. Fortunately, however, the region is blessed with enormous sub-surface storage made possible by the great alluvial deposits underlying most of the valleys and the coastal plains. These porous gravel and sand beds often have a depth of more than a thousand feet. At the time of the settlement of California they were completely saturated with water and, in many localities, under great hydrostatic pressure. This great storage, now much depleted, still represents an asset of incalculable value. Some idea of the importance of these underground strata may be gained when it is realized they provide the sole source of water for hundreds of thousands of people and most of southern California's agriculture.

However, in almost all areas the rate of withdrawal far exceeds natural replenishment. The gradual development of this dangerous overdraft will be discussed later.

If we could turn the time back to the last decades of the eighteenth century we would have the opportunity of seeing southern California in its natural condition with lush green grass for cattle and sheep in wet years and with sparse and inadequate forage in dry periods. The missions and ranchos were located on streams that were not supposed ever to go dry, or they were near natural spring areas which were called *cienagas*. Farming was hazardous and life was not always so easy as it is now pictured. It was indeed frequently a matter of feast or famine.

Some reference to the old records may be of interest and show the variation of precipitation and the risks of farming. Father Juan Crespi wrote of crossing the Los Angeles River on January 7, 1770, and “observing on its sands rubbish, fallen trees, and pools on either side, for a few days previously there had been a great flood which had caused it to leave its bed.”

De Anza wrote in his diary on New Year's day of 1776 about his experience in crossing the Santa Ana River near the present site of Riverside: “It was found to be almost unfordable for the people, not so much because of its depth as of the rapidity of its current which upsets most of the saddle animals.”

The annual report of the Mission

San Diego in 1780 included the observation: “A few days ago we had a heavy rainfall which filled the river bed and lowlands where the wheat and barley had been planted. . . . The Indians are now working hard to remedy the trouble for the present and to prevent similar disasters in the future.”

There were also periods of extreme drought. On April 26, 1796, Father Lasuen wrote: “In the year (1795) preceding we saw ourselves compelled to send one-half of the neophytes for some months into the mountains to search for food, as in the manner of savages, whilst we maintained those staying here on half rations, and a little milk, until the time of the wheat harvest.”

This drought period was severe and protracted, causing difficulties at all of the missions. Concerning the Mission Santa Barbara, a letter from Fathers Tapis and Miguel says: “Repeatedly in the year 1794 the water stopped to flow at one-quarter league from the Mission . . . and the harvests are small considering the amount of grain planted.”

For eleven years, beginning in 1810, the records show excessive rainfall. In 1822 there commenced, however, a period of drought which lasted for ten years with the interruption of the flood of 1825. Dr. Fernando Martin of Mission San Diego, wrote to Governor Echeandia in January 1831, and referring to the lack of forage said: “In this year of drought, when there is no pasture for the sheep, where shall they be placed?”

Commandante Santiago Arguello also wrote in January of 1831, and said: “The Mission (San Gabriel) in sterile years can scarcely support its neophytes as has happened in last

two years.” Other years in the 1830's were very wet. The season of 1840-41 was very dry and General Bidwell, who entered the state at this time, is reported as saying there had been no rain for eighteen months.

The pastoral and romantic period of southern California history really ended in 1868 with the drilling of the first artesian well on the Downey and Hellman property about six miles north of Wilmington. Stages detoured from the old Tomlinson Stage Road to view and marvel at the strange sight. The event must be regarded as the beginning of the period when water was mined from the soil, land exploited and irrigated agriculture greatly expanded.

So closed a romantic period of southern California history, when life was gay and unhurried, when fish and game were abundant, when hospitality was generous, even prodigal, with an almost unending series of fiestas and parties. Still there were problems and it was not quite the Garden of Eden as is suggested in fable, song, novel and drama. This was, however, a fabulous period gone—never to return.

It was soon discovered that it was possible to drill wells in many locations and that they would flow. As the old-time promoter said: “Just shove a pipe down into the ground and an unlimited supply of water gushes forth.”

The area in which flowing wells could be secured extended over many thousands of acres of Los Angeles and Orange counties. These wells flowed because of the alluvial character of the valleys and coastal plains. For countless centuries detritus from the mountains had washed down into the sea; beds of sand and rock were covered by thin layers of clay. These beds sloped down gently and the layers of clay made it possible to build up hydrostatic pressures. So it was really true that when these gravel beds were penetrated the water did “gush forth.” The area irrigated by flowing wells was very small compared to what was later put under irrigation by pumping. The supply, alas, was not unlimited and, by 1930, flowing wells had practically ceased to exit.

The decade following the drilling of the first artesian well saw a substantial but conservative development of horticulture in the area. Livestock became relatively less important. Following the completion of the railroad in 1876, a limited number of tourists began to arrive. People throughout the nation and in various other parts



William Mulholland, imaginative and bold, designed Owens River Aqueduct



This oriental looking wheel was used from 1860 to 1870 to raise water to the level of original reservoir

of the world began talking about the wonders of southern California. It was fabulous talk, a picturesque combination of truth and fancy. Like the artesian wells, it began to spout into the air; unlike them, it has not weakened or dried up with the years, but continues to the present day.

During the eighties this boasting talk increased in a steadily mounting crescendo, with many reverberations across the continent. The Santa Fe Railway had just been completed and then came the boom. People arrived from every corner of the nation and from all parts of the world. Frantic buyers stood in line all night to get first chance to buy lots in towns that existed only on paper. "Cities" were surveyed and started all over southern California. Steam railroads were constructed in all directions, new hotels were built or commenced, colleges were established or projected. Land titles changed so fast that public records were confused and confounded.

Like some gigantic meteor the boom roared on, burning with feverish heat. When the collapse came it was one of the world's greatest, complete and devastating. Quietly, sadder but wiser, those who had some money returned to their former homes, saying little of their losses. There were, however, many thousands, the last owners of inflated properties and business lots in imaginary towns, who did not have the re-

turn fare. These stayed, with small means but with undaunted courage, to recoup their fortunes.

So from the burned ashes of the fantastic boom arose a great determination to really build the golden hued commonwealth which the boosters had described. Folks went to work, a marvelous remedy in many social and economic crises. Real towns were completed, colleges were built, horticulture was expanded, genuine tourist travel was promoted. The Los Angeles Chamber of Commerce had been established and it went to work with an enthusiasm that has never failed in the last sixty years.

The decade of substantiation began. Everyone did his utmost, individually, and all joined in a great community effort to put the "Land of Sunshine" on the map. Most of the world knows much these hardy and somewhat stranded pioneers accomplished. They started their work so well that after sixty years it rolls on like a snowball on a slope, gathering size and momentum all the while.

About this time the father of the writer arrived on the scene—a young man who resigned a good government position to come to southern California with his bride. He did not come because of the boom nor did its failure deter him. He was interested in horticulture and was going to operate Rosecrans Rancho which had been purchased from the federal gov-

ernment by his father, General William Starke Rosecrans. He also had a hunch that there was oil under the rancho, which in those days people considered a huge joke. It took him thirty years to get the laugh on the scoffers and produce a rich oil field.

About a year after Carl Rosecrans arrived in Los Angeles County a neighbor, who had some land that in relation to sea level lay lower than the nearby Compton artesian belt, drilled a well expecting that it would flow. Greatly to his disappointment and chagrin it failed to do so. He approached Rosecrans and asked him if he thought the well might be pumped so as to produce a large enough supply to use for the irrigation of a forty-acre tract. Heretofore this had not been attempted, although windmills had been installed and had pumped water from drilled wells for domestic purposes. All the neighbors looked askance at the project, believing that if a pump were installed the well would be drained in a matter of minutes.

Rosecrans, on the contrary, thought it a good gamble and proposed to West, the owner of the well, that if he would rent a centrifugal pump such as were then in use along the rivers of northern California, the Rosecrans portable steam engine, used for threshing grain, would be available without cost for the experiment.

The test was accordingly made and
(Turn to page 34)

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Solving the Riddle of Low Grade Hardwoods

By I. T. HAIG

**The South's vast areas of pine can be perpetuated only
by reversing nature's strong favoritism for hardwoods.
Here is how research foresters are tackling the problem**

ECOLOGISTS and foresters have long agreed that over much of the eastern seaboard the natural forest climax is hardwoods. Even the great pine forests of the southern coastal seaboard, the extent of which led to the assumption they were climax in nature, are shown by ecological evidence to be a fire subclimax, ultimately replaced, if natural forces are undisturbed, by a forest of deciduous trees dominated by such species as beech, maple, basswood, oak, red gum and tulip tree. The pine forests of the southern coastal plain were the result of

accident, the children of disaster and disturbance.

Early travel accounts confirm the much greater abundance of hardwoods in the original forests, even in the Coastal Plain where pine stands were plentiful and immediately productive of naval stores and other articles of commerce. In the Piedmont, where pine is now so conspicuous in the forest landscape, the earlier predominance of hardwoods was apparently very striking. John Lawson, for example, one of the best of the early observers, reported in 1701, "no pine trees for two days"

in travel through the North Carolina piedmont west of the Haw River, and noted that it was not until his party approached the upper Coastal Plain that they saw "... a prodigious over-grown Pine-tree, having not seen any of that sort of timber for about one hundred and twenty-five miles." It was the settlers' land clearing and abandonment, and the widespread use of fire followed later by extensive logging, that assisted pine and diminished hardwood.

Additional evidence on the strong, natural trend toward hardwoods has become visible in recent years in the form of dense hardwood stands and understories on former pine sites. In the Virginia coastal plain, for example, it is estimated that hardwood species of low commercial value have occupied twenty percent of a two-million-acre loblolly pine site. Hardwood types in South Carolina occupied thirty-nine percent of the forest land in 1947 as against twenty-seven percent in 1936. In the same period, the number of hardwood trees of one to five inches in diameter has increased as much as sixty percent in some sections of the state. There is little doubt that the conversion of pine stands to hardwoods is already under way on a large scale.

Thus, it should be clear to foresters and forest landowners in the South that over vast areas pine stands can be perpetuated only by arresting or reversing a strong, natural trend. This creates no special problem in the permanent hardwood forests of the uplands and in hardwood swamps and river bottoms. But over widespread areas now classified as pine type, covering some sixty million acres in the Southeast alone, forest managers must decide whether or not pine is to be perpetuated, and, if it is, take the necessary silvicultural measures. Perhaps most foresters have been overly slow to realize this situation and accept its implications.

Typical example of hardwood invasion in coastal South Carolina. Pine seedlings will have a hard time of it

Hardwoods are taking over this pine stand, though seed trees were left after cutting operations two years ago

Photos by Todd & May





Photos by Tedd & May

Frequent fires have maintained an open understory in this 45-year-old loblolly pine stand. When the mature trees are harvested, there will be no aggressive hardwoods to compete with the reproduction of pine necessary to stock a new stand

Until recent years there have been only a few vigorous proponents of drastic measures in the interest of pine perpetuation.

Indeed, though most foresters and landowners have thought in terms of pine perpetuation, we have worked quite effectively against this objective through such widely accepted and forcefully advocated policies as complete fire protection, fire exclusion if you will; partial cutting, thus encouraging more vigorous growth of tolerant hardwoods; and commercial harvest cuttings, which have removed

the pine and left the hardwoods to grow to dominance.

Should we be concerned? If the hardwood forests of the Piedmont and the upland better-drained areas of the Coastal Plain were as productive and as valuable as pine forests, we would have no proper cause for concern. Indeed, the natural successional trend would make our work of forest management all the easier. But the evidence is to the contrary. Pine types in these areas not only grow at a faster rate than the hardwood types, but they also produce

wood of greater average value. Both measured growth rates and average stumpage prices have been higher in pine stands. Many of our good pine sites will not grow the more valuable hardwoods at present, though they will grow hardwoods of inferior kinds.

In addition, the preference for softwoods is very marked. In 1947, with a wealth of both hardwood and coniferous forests from which to choose, seventy-five percent of our lumber production in the United States was softwoods, and only

Some agricultural weed killers, properly sprayed on foliage, can control many inferior hardwood species

Disking with heavy equipment serves a dual purpose. It destroys inferior species and makes a seedbed for pine



twenty-five percent hardwoods. In the South the same year, we manufactured over twice as much lumber and eight to ten times as much paper and paperboard from softwoods as from hardwoods, though the cubic foot volumes available in hardwoods was almost one third larger and the sawtimber volumes only one third smaller than for softwoods, chiefly pine. Indeed, the preference for softwoods seems worldwide. The FAO report of 1945 on "Forestry and Primary Forest Products" notes that "Estimates place the present (world) forest area at 8,000 million acres, but commercial exploitation has hitherto been largely confined to the predominately coniferous forests of

pine stands will entail changes in the character of our forest industries which can be made only at great expense in terms of plant changes and depreciation, as well as in smaller supplies of an inherently more useful material.

The utilization of more hardwoods is, of course, one of the measures that should be taken to help meet the hardwood problem. We can and should learn to utilize more hardwoods in the South. We are already learning to use such woods in new ways and in greater quantity. In the chemical field alone there are good possibilities for expanding hardwood use—as in making dissolving pulps, in hydrolysis to sugar, molasses and

could be manufactured from hardwoods.

Again, the production of dissolving pulps is a source of potential hardwood use. But only four percent of the total pulpwood consumption is for rayon, cellophane, and associated products. Even if this use could be doubled or tripled (and over two thirds of the rayon produced is now based on wood fibre), its effect on hardwood consumption is obviously very limited. It seems improbable that better utilization alone can solve the hardwood problem in view of potential hardwood volumes. And these volumes will be greater if large areas now bearing pine forests, especially in the Piedmont, have to be returned ultimately to hardwood or hardwood-pine mixtures in the interests of good soil management.

Surely, under these circumstances, forest managers must assume responsibility for growing the more widely useful and productive pine, if this can be done in healthy stands without soil deterioration and at reasonable expense. I would like to emphasize these restrictive terms. Good management will only permit arresting natural successional trends, in the interest of greater social and economic returns, if pines can be grown in healthy stands, without eventual exhaustion or serious deterioration of soil fertility and at reasonable expense. It is our job as foresters to develop the necessary information and skills if we are to be resource managers worthy of the term. And we can only grow full crops of pine if we learn to control the hardwood invaders.

What do we know about hardwood control? As yet very little. In the vast Piedmont region, where the problem of pine perpetuation will, in my opinion, be most difficult and complex, there are few or no substantial studies; no evidence as to whether or not pines can be perpetuated indefinitely without serious site deterioration. The probable limitations in this rolling, erodible country on the use of fire, perhaps a potent silvicultural tool elsewhere, and the great need to build up already exhausted soils in many places, emphasize the complexity and difficulties and highlight the lack of knowledge on which to base sound, long-time management.

In the Coastal Plain our evidence, while still fragmentary, is much more satisfactory. In the slash-longleaf pine region, past and current practice, including widespread use of pre-

(Turn to page 40)

It may be necessary to use bulldozers or other heavy equipment to perpetuate stands of pine on areas where larger hardwoods are threatening to take over



the temperate zone." It would seem that man's experience has been that softwoods, and especially the pines, furnish the most versatile and useful materials, and the most favorable base for an active and vigorous forest industry. The greater adaptability of softwoods for construction purposes, the ease with which such wood, especially pine, is manufactured and seasoned, the longer length of fibre resulting in stronger papers and paper products, these and other reasons inherent in the wood itself obviously have played a prominent part in encouraging widespread industrial use. Foresters must face the fact that in the South any substantial conversion to hardwoods of present

high protein feeds, in the preparation of various extractives.

Yet, when one considers such possible uses in relation to potential supplies, the large-scale expansion of hardwood utilization seems strictly limited. For example, the expanded use of hardwoods in pulp and paper production has often been cited as one of the ways in which an increased growth of hardwoods could be properly utilized. Pulpwood consumption in the United States in 1947 was about 19.7 million cords. The volume in cull hardwoods alone in the South is some 300 million cords, enough to support the pulp and paper industry of the entire country at the 1947 rate for fifteen years if all pulp

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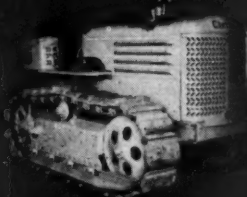
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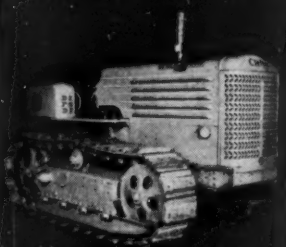
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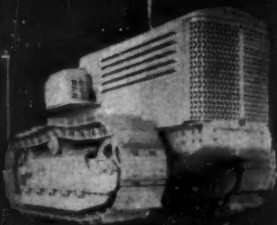
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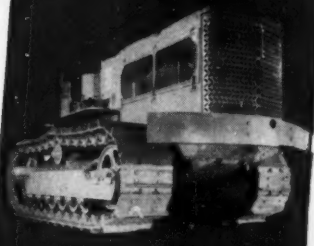
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Government Gets Rockefeller Lands in Jackson Hole

A gift by John D. Rockefeller, Jr. of 33,562 acres of land in Grand Teton National Park and the adjoining Jackson Hole National Monument, in Wyoming, was made to the people of the United States on December 16. Secretary of the Interior Oscar L. Chapman accepted the lands on behalf of the federal government and the National Park Service.

The presentation was made by Laurance S. Rockefeller, president of Jackson Hole Preserve, Incorporated, and son of John D. Rockefeller, Jr.

Acquired and maintained over a period of a quarter of a century at a total cost of more than \$2,000,000, the lands now will be administered as part of the National Park System. The deeds specifically provide that they shall be used for no other than public park purposes, "and they will automatically revert to Jackson Hole Preserve, Incorporated, should the

government for any reason find it necessary to divert their resources to other purposes," Secretary Chapman said, adding that he could conceive of no foreseeable conditions under which such reversion could possibly be necessary.

The Secretary also expressed gratification that the Rockefeller family will continue their interest in the area, despite this passing of jurisdiction. He pointed out that this interest will continue, through Jackson Hole Preserve, Incorporated, in the restoration of historical structures, such as Menor's Ferry; that operation by the corporation of tourist lodges located on lands just ceded the government will continue, and that the corporation will continue to participate in the administration of the Jackson Hole Wildlife Park. The arrangement that the corporation has had for participation in the Jackson

Hole elk herd management, through furnishing hay for winter forage, also will be continued. The entire question of the management of the Jackson Hole elk will be worked out later, the Secretary said, by the National Park Service, the State of Wyoming and others interested.

Transfer of the lands to federal ownership will in no way affect leases entered into in recent years with local citizens for cattle and dude ranching operations, he declared.

Grand Teton National Park and Jackson Hole National Monument together form a matchless combination of scenic beauty. Within the park is a massing of mountain peaks, the scenic climax of the region, much of it above timberline. The Grand Teton itself, loftiest peak in the park, rises to an altitude of 13,766 feet, and has been referred to as the "most noted historic summit of the West."

Forest Service Report Highlights Research Progress

More than forty years of research and its contribution to better management and use of forest resources are reviewed in the annual report of Lyle F. Watts, Chief of the U. S. Forest Service.

Pointing out that since 1908 the Forest Service has developed eleven regional forest and range experiment stations in continental United States, a tropical forest experiment station in Puerto Rico, a forest research center in Alaska, and the famous Forest Products Laboratory at Madison, Wisconsin, Mr. Watts declared that the work of these stations is leading to wiser management of forest and range resources and to better control of fire, insects, disease and noxious plants. For example:

"In the Lake States research has shown how to follow nature in the selective cutting of northern hardwoods and is approaching the secret of the ideal stand density for that forest type. In the California pine region we have found out how to anticipate the bark beetles and save, by well-timed harvest, great volumes of timber that would otherwise be lost.

"In the northern Rocky Mountains valuable crops of western white pine can be grown in spite of the blister rust. In the Northwest practical logging systems are being worked out to get good reproduction of Douglasfir. In the Southwest, where heat and drought make it nip and tuck between forests and grasslands, we have

learned to cut little and often, always leaving the best trees.

"In New England we are learning to live with the spruce budworm and still produce continuous crops of spruce and fir. In the Central States research is showing how to make valuable forests grow on the spoil banks created by surface mining. And in the South, it is showing that good forestry can pay in a surprisingly big way."

Dealing with the outstanding achievements of the Forest Products Laboratory, which, he said, has produced results worth millions to lumber manufacturers, wood processors and consumers, Mr. Watts brought out these highlights:

More than 5000 commercial kilns now employ the internal fan system of controlled drying invented by the laboratory to season lumber rapidly and safely. Laboratory studies in the preservation of wood have aided American railroads in saving more than \$100,000,000 annually in the cost of crossties. Railroads have cut crosstie replacements from 265 a mile in 1915 to 112 a mile in 1947.

Among its multitude of projects, the laboratory has studied more than 100 American woods used in making wood pulp, and found new combination of woods suited for making newsprint. Its investigations show that lower-grade hardwoods can be used to make many kinds of paper for which increasingly scarce softwoods have been required. Furthermore, the

laboratory carries on continuous research in cellulose products used for paper, rayon and cellophane. It has made wood molasses that is being tested as a high energy food for livestock and poultry.

As to research on range problems, Mr. Watts brought out that techniques have been worked out for reseeded many denuded western ranges which will often increase forage from ten to twenty times. More than five million acres of range land have been reseeded by methods developed through Forest Service research. Approximately ten million additional acres in the West can now be seeded successfully at reasonable cost.

In reporting on the 152 national forests, Mr. Watts stated that more than three and a half billion board feet of timber, about the same as in 1948, were cut during the fiscal year 1949. Receipts from timber sales jumped from \$20,594,000 to \$26,927,000.

During 1948, he said, nine million head of livestock were grazed on national forest ranges. Water worth \$300,000,000 flowed from the forests, and hydroelectric power worth \$30,000,000 was generated from this water. Twenty-four million people used the forests for recreational purposes.

At midyear of 1949, 3740 fires had been fought in national forests. All but twenty-one were controlled within the first twenty-four hours, and the burned area was held to 41,791 acres.

Adventuring in Trees and Grass



In this second installment of his six-part narrative Mr. McKnight, self-styled "front porch farmer," describes the establishment of a six-plot pasture plan. At present his cattle are grazing sixteen acres of woodlands! The how, why and wherefore make an interesting chapter in this account of the restoration of his 186-acre Virginia farm.

By HENRY T. McKNIGHT

"Stuff being planted and stuff being written,
Fields growing lush that were once unfitted,
Bromfield land, whether low or high land,
Has more going on than Coney Island."

SO wrote E. B. White in his review in *The New Yorker* of Louis Bromfield's *Malabar Farm*. Here at Cornwell, our new farm in northern Virginia, stuff is being written for *American Forests* about stuff being planted. Our hope is that other new farmers, perhaps even some experienced ones, will gather from these articles enough ideas to be worth the time it takes to read them.

We are writing, as we explained in the January issue, about a grass-cattle-conservation type of farm. We are "front porch farmers," as Channing Cope might say. In our fields and meadows we are attempting to develop a nutritious and weather-proof pasture program that will carry the maximum number of profitable beef cattle the maximum number of days a year.

The arithmetic of our pasture system is a series of six fifteen-acre plots. Management control is exercised through a program of fertilization which brings each pasture into top grass production at the time, in the grazing season, we need it. Different mixtures of grasses and legumes in each pasture assist the timing to the point where, on paper at least, it is possible to rotate our cattle through the six-plot series in two-week periods during the grazing season, always securing the forage at the right stage of its growth for nutritiousness and palatability.

Establishment of the six-plot plan at our farm was actually under way before we even knew there was such a thing. Last spring Harry Parks, district soil conservation officer, had recommended the re-establishment of our old permanent pasture into a new stand of orchard grass and lespedeza—an area which will comprise two of the six new plots. Another pasture in an old sod of the same kind provides the third. Then Congressman Thruston Morton of Kentucky, staunch advocate of Kentucky fescue 31, persuaded us to put in a fifteen-acre planting of his miracle grass mixed with ladino clover to check erosion and provide lush pasture when other grasses are in their dormant period.

To institute better management, Professor Carl B. Bender of Rutgers University, who introduced the six-plot system to this country, suggests that our fifth field be seeded to a

combination of southern brome grass and ladino clover, a later-maturing strain that will bring the rotation into better balance. The sixth pasture, presently good only for quail, will not be improved until we have the required hindsight to bring our total ninety acres of pasture into complete balance.

Lime, fertilizer, grass and legume seed, plus what Professor Bender calls "the conscientious use of the mowing machine," are our principal tools in bringing this pastureland back to intensive management. Assisting us are sixteen "hired hands"—sixteen head of grade beef cattle under the general supervision of Ferdinand, a yearling Hereford steer who came to the farm last spring as a gift. Originally slated for our deep freeze, Ferdinand has become such a family pet and such an efficient leader of his fifteen smaller Angus assistants that any idea of eating him is now unthinkable.

The present location of Ferdinand and his helpers may raise the eyebrows of certain foresters. This winter we are grazing sixteen acres of woodlands in the Cornwell tree farm. Reason: this particular area is so heavily infested with honeysuckle that present annual tree growth is reduced to two percent—new growth to a standstill. As an experiment in honeysuckle control, B. C. Ritter and Marcel Pfalzgraf, of the Virginia Forest Service, suggested that we stock sixteen head, or a head an acre, in this part of the woods and accurately record the results both as to woodlands and to cattle.

The steers are mashing down trails throughout this area we call our "vertical pasture," and now for the first time it is possible to see what trees are growing there. And they are definitely holding their own on the honeysuckle menu. It not only feeds them but also provides shelter. We are supplementing this leafy diet with lespedeza hay standing in a rick, and later on will probably add commercial feed to insure



the steers against too great a winter loss. We want them to be in good shape for the coming spring when we will add twenty-four more to the herd, to give us a total of forty "hired hands."

Our eventual aim for the farm is a forty-cow purebred Angus herd. But the purebreds will have to wait until our grasses are more nutritious and until we have built the kind of barns we will require.

Critics of woodland grazing will be pleased to note that on the rest of our tree farm we are operating in a more orthodox manner. Cuttings are for locust fenceposts and other farm needs. In one portion, heavily timbered about forty years ago, we have set up a hardwood reproduction area where we are now thinning out the culls to improve the stand.

And so, whether the winter's work be devoted to trees or grass, whether

on low or high land, the activity definitely compares to Coney Island. Next month, here in *American Forests*, we will trace the development of our complete conservation plan. Later in the spring, while on a business trip to the West Coast, we plan to take a look at one of the Weyerhaeuser tree farms. It will be interesting to see what a small tree farmer can learn from a large commercial operation.

Water and the City of the Angels

(From page 25)

to the surprise of the scoffers, the well did not pump dry in a few minutes. Instead, for three days and nights it produced about 700 gallons a minute. West then installed a stationary steam engine. The well produced steadily for over twenty years when it collapsed by reason of rusty casing.

So was learned the process of mining water from the subterranean strata. By 1930 wells being pumped in southern California had a capacity of 3,438,800 gallons a minute.

Just as the drilling of flowing artesian wells had given a great stimulus to the development of agriculture and the settlement of southern California, the pumping of large flows of water from the ground in many then dry farmed areas provided a far greater stimulus to a new and substantial epoch of expansion.

A very interesting theory was held by some of the old-timers at the turn of the century. Seeing the great volume of water flowing or being pumped from the ground, they assumed that it could not be derived from the local watersheds, the somewhat limited areas of which was quite apparent. It was believed there must be an underground river flowing into southern California from an unknown point in some other state north or northeast. To explain the existence of a possible river bed it was assumed that there must be a great fault even more important than the well-known Andreas fault. This latter extends from Sonora in Mexico to Cape Mendocino 125 miles north of San Francisco and is the center of much of California's seismic activity.

The hypothesis of an underground river furnished a convenient explanation of large volumes of underground water. It conveyed the self-satisfying suggestion that the supply was perpetual and unlimited. It is interesting to note that this unmitigated yarn was seriously used as an argument against the proposed construction of the

Owens River aqueduct.

An interesting phenomenon of the time was sometime cited in support of this theory. West of Compton was a well which had been drilled about 1890. It originally flowed about thirty inches of water, gradually diminishing until 1907 when it ceased flowing. By means of a crude plug the water was used from time to time to fill a horse drawn sprinkling tank that laid the dust on Compton's rural streets. People driving or riding into town let their horses drink at the pool which surrounded the well, and they often marvelled at the little fish which came up with the water. These were the size of small minnows and were blind. They could not live in the light and died shortly after coming to the surface.

"Of course," said the old-timers, "these fish came down gradually in a period of years through the underground river. They could not have lived for thousands of years under the ground."

In the year 1900 the City of the Angels had a population of just above 100 thousand. The community leaders, however, had great expectations for future growth. Quite a few predicted that some day it would be bigger than San Francisco and have a million people. All recognized that the then water supply would not be enough for a city half that size. Much speculation took place on how to increase the supply. At that time the city water department was headed by William "Bill" Mulholland. A natural leader of men, with little formal education, he had worked his way up from a day laborer to the top. He was a man who had great imagination and courage and inspired confidence in all who knew him.

Mulholland persuaded the city to permit him to explore the eastern Sierra slope to see if it were possible to obtain a supply of water there. After months of study he boldly pro-

posed to build the Owens River aqueduct 240 miles through rugged mountains, a greater undertaking than ever had been attempted by any municipality. Its cost would stretch to the utmost the bonding capacity of the city.

Subsequently careful engineering surveys substantiated the feasibility of the aqueduct. After several years of hard effort the project was approved by the voters. The bonds were sold and actual construction started in 1908, requiring five years for completion.

Mulholland, while self-taught, was a brilliant engineer. He laid the project out as a whole but placed the design of the great conduit in the hands of J. B. Lippincott, a highly trained engineer. The size of the great conduit, the ruggedness of country and its remoteness posed construction problems that were numerous and difficult. Work had to be done in a wild desert country without modern roads or heavy construction equipment. Great sections of steel siphons having a diameter of about ten feet had to be hauled into wild desert canyons. Teams containing as many as fifty-seven mules were used. So far as the writer knows these were the largest teams ever hooked together. Tunnels over eight feet wide and eleven feet high were bored through barren mountains. The writer remembers with great vividness driving up along the aqueduct with Engineer Lippincott, using an old barrel-nosed Franklin which was the only car that could negotiate the grades and stand the heat.

The completion of the aqueduct in 1913 was hailed with great rejoicing. Most people thought that the water problems of the City of the Angels were solved for many decades, if not permanently.

(How mistaken they were is told by Mr. Rosecrans in the March issue.)

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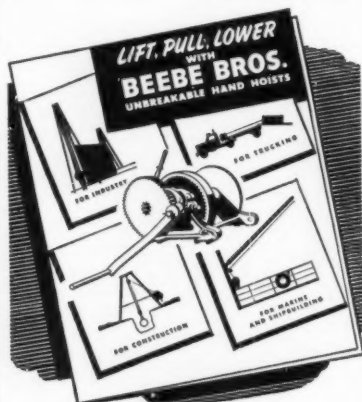
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Land Use

(From page 14)

The value of the project was proved early in 1943, less than two years after it was launched, when a spell of heavy winter rain produced unusual flood discharges from the still unstabilized stream channels and caused a considerable movement of rock, sand and mud which imperiled property and lives. But actual damage was relatively low. The watershed restoration work already accomplished prevented a load of about 250 thousand cubic yards of debris that had moved into the channel of Arroyo Seco from gravitating into the Devil's Gate Reservoir. Mustard plants also helped to prevent the sloughing off of soil which otherwise would have drifted into the overloaded waterways.

The activities undertaken on other watersheds by the Department of Agriculture have the same basic purposes of flood and sediment reduction as those under way on the Los Angeles River drainage.

In some parts of the United States associations of farmers and other landowners have launched small-scale watershed restoration programs on their own initiative—as on a 74,500-acre watershed drained by a tributary of the Maquoketa River in northeastern Iowa, where four conservation districts have banded together to save a valuable reservoir by checking the silt washing into it from badly eroding farmlands. Residents of Weber County, in Utah, organized a Watershed Protective Corporation to purchase about 2000 acres of overgrazed mountain land and recently turned it over to the Forest Service for restoration, protection, and management.

These are examples of really effective efforts to safeguard our watersheds by coordinated planning, restoration and maintenance. Unfortunately, their number is meager.

V

Despite all the healthy manifestations of progress toward a rational and scientific approach to our land and water problems, and the determined conservation efforts of private groups and public agencies, involving outlays of billions of dollars, these stark facts remain:

Soil losses are still enormous on the crop lands, grasslands and forests of the nation.

The vast expansion in cereal production since 1940 has forced the abandonment of many sound conser-

vation practices. Increased planting of soil-depleting crops such as soy beans and peanuts, and rebreaking the sod for profitable wheat production on millions of acres of dry lands in the West, which had been previously damaged and restored to their former grass cover at great public expense, have materially set back the fight against soil erosion.

About three million acres of grassland on the Great Plains have been plowed up since 1946 alone, and in the meantime summer fallowed land and land farmed on the contour have declined in this area. A new and perhaps worse dust bowl is inevitable when the next major drought and wind storms hit the plains.

Forest depletion continues. Annual sawtimber growth is only half the drain from cutting, fire, disease, and insect depredations. Much worse, forest soil losses are affecting the growth and vitality of the trees as well as aggravating flood and water supply difficulties downstream.

Western grazing lands—public as well as private—are still much too heavily stocked for the forage they produce. Unless the erosion from these largely semi-arid areas can be effectually checked, many of the great dams and reservoirs on the Columbia, Colorado and other river basins are doomed to failure.

Finally, despite the expenditure of hundreds of millions of dollars annually for damming, dredging and otherwise attempting to stabilize and normalize major river systems, we do not seem perceptibly to be reducing floods, siltation, or pollution.

The people of the United States have taxed themselves heavily to rehabilitate damaged areas without imposing any requirements upon private owners for minimum upkeep afterwards. Too often conservation practices on agricultural and forest lands have stressed the prospects of immediate financial gains rather than rebuilding the basic resource capital—the soil.

This is one of the reasons why land-use solutions for our watershed problems may be regarded as too little and perhaps too late. Essential for the protection of the national interest, and for the continued maintenance of our position as a world power, they are planned—like the big dams and reservoirs—too much on an uncoordinated basis to accomplish the greatest long-time social good. Moreover, excessive emphasis is still

laid on surgical treatments, especially engineering devices, rather than on the application of agricultural and grazing practices which would stop further losses or deterioration of soils and water.

With our soil and useful water supplies diminishing steadily—in some areas alarmingly—the time has come for the nation to take stock of its problems and attempted solutions and correct the grave imbalances. Those responsible for land-use programs seem to lack imagination, drive, and ingenuity which characterize resource engineers.

The essential planning should take account of both watershed and waterway needs and develop solutions that will correlate the restoration of the land with control of the rivers. This kind of planning is nonexistent in the United States. In short, we should stop putting the cart before the horse, but hitch them together to achieve maximum effectiveness.

Society of American Foresters Elects Charles F. Evans

Charles F. Evans of Atlanta, Georgia, assistant regional forester for the southern region of the U. S. Forest Service, has been elected president of

Charles F. Evans
U. S. Forester Named SAF President



the Society of American Foresters for the two-year term 1950-1951. He succeeds Clyde S. Martin of Tacoma, Washington.

Clarence S. Herr, resident woods manager of the Brown Company, Berlin, New Hampshire, was elected vice-president of the Society.

ANNOUNCEMENT

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Seaboard Railroad

(From page 9)

Association and the state foresters. In recognition of Seaboard's contribution to forestry in its own area, the national Future Farmers of America in 1947 awarded Bob an Honorary American Farmer's Degree."

The effectiveness of this work with FFA has been well demonstrated by a 200 percent gain in boys' individual projects in Florida and increases in other states of sixty-five percent and above. Both Mr. Daily and Mr. Hoskins concur that the most effective work in this job of "preaching the gospel of the perpetuation of our forests" can be done through organized groups. It is to such groups that Seaboard's *Forestry Bulletin*, the first railroad forestry publication in America with a circulation of 13,000, addresses much of its material.

In carrying on his program, Forester Hoskins gives much credit to the assistance of the men under J. P.



**C. B. Rice, vice-president,
 in charge of operations**

flected in a stroll through the Seaboard offices in Norfolk as well as in talk to key men on the line. The railroad's key interest is, of course, freight tonnage and wood for maintenance, as was summed up in the dry comment of J. K. Morgan, the assistant freight traffic manager, "It's rather important that we have some traffic to haul."

R. W. Cook, chief tie and timber agent, sees a bright future for foresters in railroading—predicts the present number of twenty-five will double or triple itself in a few years, sees more young foresters working in the purchasing end. Major W. D. Simpson, chief engineer, still fearful for the future of the South's timber supply wants to see the region's forestry effort stepped up even more.

All are hopeful and their attitude is perhaps best reflected in a forestry message which has been used on menus in Seaboard dining cars including the Orange Blossom. It reads in part:

"The trees seen from your train



**Dallas T. Daily—Seaboard
 general industrial agent**

Derham, Jr., the railroad's freight traffic manager. These traffic men in thirteen divisional offices, each with two or more sub offices, are strategically located on the system and serve as contact men for the forester not only in providing him local contacts but also in promoting needed reforestation.

Last year, organizations working in conjunction with Seaboard, chiefly Future Farmers, set out fourteen million seedlings in southeastern states. Next year they are shooting for fifteen million. And if present plans to effect a coalition of young businessmen and farmers through the Junior Chambers of Commerce materialize, a tremendous surge of tree planting can be expected from this quarter.

There's a vitality and drive in southern forestry today that is re-



J. P. Derham, Jr., head of the railroad's freight traffic department

window are YOUR trees but they are not those that stood in the forests when our forefathers set foot on these shores. The original virgin forests have long since fallen to the swing of the woodman's ax or have been laid waste by devastating fire. . . . As a result of laying waste to YOUR forests during past generations, we are confronted with a critical situation with respect to our economic welfare. . . . The Seaboard Air Line Railroad, through its industrial department, employs a forester for the purpose of coordinating activities with state and federal forest services and wood-using industries, looking into the future for far greater returns from harvests in well-managed woodlands. You, too, can help—by using your influence with those whom you have elected to public office and with everyone else concerned to see that foresters are provided with the necessary wherewithal to preserve these trees so that you, and those who come after you, may enjoy the good things of life produced so economically from the world's greatest resource."

NOTICE TO READERS

Back copies of *American Forests* for the years 1911-1934 inclusive are being made available the next two months at fifty cents per copy. After that, only a limited supply of issues published prior to 1945 will be kept on hand for research use and will be sold at a dollar a copy.

Conservation, one of the last great stories in the stream of time, is in great need of more articulate programs like that of Seaboard's to help crystalize the effort to protect our forests and related resources from further damage and abuse. Other programs in the South may have contributed more heavily to conservation in specific areas but no program has been more vocal than Seaboard's or has had a more sparkling effect on the public consciousness. More like it are needed.

If indeed, "it is time to take industry off the hook on which it was hung a decade ago" as one southern industrialist expressed it, the hard-driving methods employed today in the interests of forestry by enlightened southern industry can serve as a model on how the "unhooking" operation can best be achieved. In other words, industry must unhook itself.

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Riddle of Hardwoods

(From page 30)

scribed burning, has retarded hardwood encroachment except on some deeper sands and drier sites where oak brush is a troublesome problem. The Southern Forest Experiment Station has done a great deal of work on chemical methods of controlling this brush by poisoning and spraying. Considerable work has also been done, much of it at the Southeastern Station, in the loblolly pine type, the other great coastal forest of the South. I think it is now clear that over much of the loblolly region, if we are going to grow full crops of pine, we must be prepared to take adequate cultural measures. It is true that the situation is variable. At many places pine will succeed pine without difficulty. In addition, our difficulties with hardwood control will probably be minimized if we can and are content to grow pine on a short rotation for pulpwood production only. But where sawtimber is desired, or more probably an integrated crop of sawtimber, pulpwood and other products, cultural measures will be more important, perhaps essential.

What are these necessary cultural measures? They are primarily measures to make certain that hardwood competition is not serious at the time of stand regeneration. They are based on the premise that tolerant hardwoods will encroach in the form of understories under pine, and that pine will not regenerate satisfactorily under this hardwood, but that pine will reproduce satisfactorily if given an even start with hardwood seedlings or sprouts at the regeneration period. Fire, release cuttings, mechanical means, and chemicals—all of these and other measures must be considered in addition, of course, to better utilization of hardwoods at the time of harvest cutting.

Recent investigations in the Southeast, especially those of Chaiken at the Southeastern Station's Central Coastal Plain Branch, have already added materially to our knowledge of what to do. As might be expected, these studies show that there will be no one method, no panacea, equally applicable to all conditions. For example, in stands of even age, fire promises to be one of the cheapest and most efficient methods of controlling hardwood invasion, if it can be used without site deterioration. Hardwoods up to about one and a half inches in diameter, breast height, can be readily killed by either period-

ic winter fires or by burning in August or September prior to winter logging or subsequent to summer logging. Hardwoods larger than this will have to be killed either by summer fire or by poisoning, girdling, or some similar practice.

Burning prior to a bumper seed crop, in August or September, will encourage adequate stocking. Where stands are many aged, containing both large and small pine, it may be necessary to reduce the overhead competition of hardwoods at the regeneration period by intensive utilization and by destroying large hardwoods by cutting, girdling, or poisoning. On cutover areas where the pine reproduction is inadequate and there are many larger hardwoods, some drastic system such as clearing the area by bulldozing may be necessary to perpetuate the pine stands. These recommendations are based on the premise that fire will kill back aerial hardwood shoots up to about one and a half inches and give pine a chance at the regeneration period if seeding is prompt, but that larger hardwoods must be cut, girdled, poisoned, or destroyed by mechanical methods or hand grubbing, simulating the conditions that occurred in the past under cultivation.

Fire, of course, seems permissible only under even-aged management on an area-wide basis, and then only if further work confirms lack of site deterioration. If periodic burns are acceptable, they should be one way and probably a cheap one, of keeping hardwoods small and controllable. Fire at five to fifteen-year intervals would probably be necessary.

Preliminary investigations also show that fire plus chemical spray would be particularly effective if needed and practical. Chaiken has much evidence as to the effectiveness of foliar sprays with such silvicides as 2,4-D (2,4-dichlorophenoxyacetic acid) or 2,4,5-T (2,4,5-trichlorophenoxyacetic acid). But though it is certain that more effective control will result from their use, usually in combination with fire, it is not yet known whether this additional step is essential, and the cost of foliar sprays is high. When relatively few or large hardwoods are present, excellent control can be obtained with ammate (ammonium sulfamate). Resprouting is insignificant.

Accordingly, though we are now beginning to know more about the methods which could be used to con-

tol hardwoods on pine sites, there is a great deal of further work to do. One of the main problems, of course, is to determine whether or not continuous cropping of pine will deteriorate soil fertility, and what site changes may be expected from hardwood reduction by repeated fires, chemicals, scarification, or other methods. About all that we can say now is that in the Coastal Plain, past practices, including frequent fires, have left no traces of serious site deterioration.

There are two other aspects of hardwood control well worth mention at this time—thinning and the small owner problem. There is no doubt that the hardwood problem will be aggravated by thinning or improvement cutting prior to the time for the regeneration cut of a pine stand. Hardwoods tend to invade old-field pine stands slowly and do not become dense or vigorous for twenty to twenty-five years. If the pine canopy is intact, the hardwood understory grows slowly although an occasional tree may become part of the overstory. But if the pine canopy is broken by thinning, the hardwoods respond vigorously to the added light and space. Closure of the canopy, as the taller pines spread out, again retards the hardwoods, but each time a thinning is made the hardwoods gain in stature and extent. The rate of growth and aggressiveness of hardwoods varies with soil and site. On a given site, the heavier the thinning the faster hardwoods develop. On one shelterwood cutting on the Santee Experimental Forest where forty pine sawtimber trees were left per acre, the small sweet gums and water oaks shot up ten feet in about eight years. The hardwoods in an adjacent uncut part of the same stand are still only about head-high.

Whether to thin or not to thin can only be determined by balancing the

income lost from maintaining an unthinned stand against some savings in less frequent hardwood control. From what we know now, it looks as if the only case that can be made for *not* thinning pine stands is where pulpwood is being grown on short rotations as a final crop. In such cases, the hardwood problem must be met at the time of the regeneration cut anyway, though it may be simpler to handle at that time if it has not been aggravated by early thinning. On short rotations, the benefits of thinning are less marked than they would be if sawtimber were being grown. In all cases the burden of proof would rest on what savings resulted from less frequent hardwood control; thinning almost always will pay off.

As to the small landowner problem, it seems evident that on the basis of present knowledge, the most promising and cheapest hardwood control measures are those that are applied on an area-wide basis, such as fire, chemical sprays, and mechanical uprooting. Such measures can be used only with even-aged management—a type of management providing irregular periodic income for limited acreages. The small landowner who prefers sustained income at short intervals will usually find uneven-aged management superior to even-aged management. If he chooses to operate his woodland so that he may get annual income from partial cutting, he will accentuate the hardwood problem or have to exert a greater effort to keep it in hand if he wants to grow much pine. It seems probable that he will be able to apply release cuttings, selective chemical treatments, or similar measures and practice selective cutting in the pine types successfully if he so desires. But a great deal of additional research is needed to develop practical methods and determine just when and where they should be used.

A SERVICE TO READERS

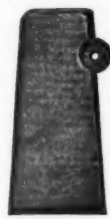
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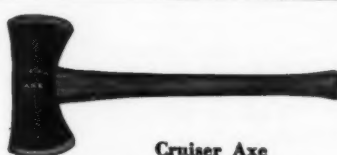
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Jelly Elliott

(From page 17)

—Robert is goin' to swaller his gum
and sing one of them sticky tunes
you hanker after." Jelly's final piece
of advice for the day was "When
you strike a match, use your head.
Be sure it's out. Dead out."

Proof that Jelly has a homely sincerity was evinced on another program "Forest and Flame in the Bible," when he told a story "about a feller who used to set the woods afire and how he came to quit all that foolishness" when his preacher steered him right.

With the Knotheads providing a background of hymns, Jelly intoned, "In Exodus it's written as plain as the nose on your face, 'if a fire break out, and catch in thorns so that the stacks of corn, or the standing corn, or the field, be consumed therewith, he that kindled the fire shall surely make restitution.'" And on the same theme from the Revelation of St. John, "Hurt not the earth nor the trees."

On another program Jelly censured "supposed-to-be-sports" for their careless ways in the woods, advised "a good sportsman makes camp fire work for him instead of against him."

As Jelly remarked at the start of the current thirteen-week series, "this show is entirely unrehearsed and unpredictable." No truer word was ever uttered in the opinion of Bill Bergoffen, Forest Service radio and television chief, who said that radio technicians in the South much prefer to handle Jelly's programs by recording rather than "alive." Some editing was necessary in the present series.

Council staff members, Forest

Service people and state forestry personnel who helped develop the series have high hopes for what Clint Davis termed "our first major attempt to obtain full coverage in a specialized field."

"These programs are specifically designed to reach back-country people in the South. These people are independent by nature and they don't take everybody's word for things. We think Jelly is going to sell them on the importance of fire prevention. He has a knack of getting along with these people and they trust and admire him. He's a real forest philosopher."

The thirteen programs in the present series cover a wide range. Beginning with the "Let's Get Acquainted" program, titles on succeeding programs are: "What Fire Does to the Woods," "Loggers' Fires," "Hunters' and Campers' Fires," "Ticks, Snakes and Weevils," "Fires Cutting the Legs Off Our Water Tables," "The Law Knows a Thing or Two," "Forest and Flame in the Bible," "Timber Sure Grows in This Country," "Smokey Bear," "Raising Good Cattle," "Ground and Brush Fires," "Burnin' and Grazin' the Woods Don't Pay" and "Help Your Neighbors, Neighbor."

State foresters who will help distribute and plug the series are showing more than usual interest in Jelly's programs and Jelly, who still keeps his other sponsors on the hook while fishing for catfish, makes an exception in the case of the Cooperative Forest Fire Prevention Campaign.

"The government needs me," is the way he explains it.

Forests of Desert

(From page 20)

skyline ridges. Two of the most popular trail trips are from Summerhaven to the top of Mount Lemmon and the easy, three-quarter-mile walk from the road to the Mount Bigelow fire lookout tower.

However, the Santa Catalinas are, but a small part of the 1,300,000-acre Coronado which also includes the Rincon, Santa Rita and Huachuca mountains. They, too, are isolated forested islands with peaks 8000 to 9500 feet rising a full mile above the valleys at their bases. To the mountain lover each has its own fascination and is worth exploring, but the Chiricahua division contains by far

the wildest, finest and most extensive high country in the Coronado.

North of Douglas, just above the Mexican border, the Chiricahuas stand like a great wall between San Simon and Sulphur Springs valleys. Thirty-five miles long, nearly twenty miles wide and rising to crests almost 10,000 feet high, the Chiricahuas are a rugged mountain wilderness. A winding, narrow dirt road leads into the mountains beside brawling Pinery Creek and climbs the divide to Rustlers Park, 8400 feet. At the road-end are pine-shaded Forest Service campgrounds—good headquarters for hiking or pack trips

into the high Chiricahuas or to scenic Cave Creek which provides fair trout fishing.

Along the backbone of the range is a twenty-mile trail above 9000 feet all the way. It traverses dense forests of Englemann spruce, the southernmost stand of this tree in North America, crosses open, grassy parks brilliant with summer wildflowers, and comes out on rocky points with sweeping panoramas of desert, valley, forest and mountain.

At the northern end of the range is Chiricahua National Monument—southern Arizona's "Wonderland of Rocks." This seventeen-square-mile government reservation, administered by the National Park Service, was set aside in 1924 to preserve a weird but beautiful region of clustered stone turrets and pillars threaded by deep, wooded canyons. A good road penetrates the monument and ends at Massai Point, nearly 7000 feet up on the windswept crest of the Chiricahuas.

Spread out below you is the "Wonderland:" a maze of rock pinnacles, canyons and ridges. You can camp in the monument, or stay at a neighboring guest ranch, and ride or hike the fourteen miles of well-graded trails. They reach the finest rock formations, lead through canyons shaded by cypress, pine and oak, and follow little streams which tumble down the rocks in miniature waterfalls.

Forty miles north of the Chiricahuas the vast bulk of the Pinaleno Mountains towers above the Gila Valley. Actually the range is a single gigantic mountain covering 200 square miles and humping its broad back 10,720 feet into the air. One of the outstanding motor trips in the Southwest is to take the excellent, but little-known, mountain road called Swift Trail from Safford to an elevation of over 9000 feet up in the Pinalenos. You rise in thirty spectacular miles from yucca and cactus into forests rivalling northern Arizona's famed Kaibab Plateau.

Rapidly climbing the steep east face of the mountain with ever-widening views below, the road winds near the crest a vertical mile above the valley below, then traverses miles of pine, fir, spruce and aspen forests, crosses mountain meadows and moss-bordered creeks, cold and crystal clear. Deer and bear are often seen along the way and wild turkeys are numerous since they have been protected within a Turkey Restoration Area.

The Pinalenos—or Grahams as they are locally called, from the name

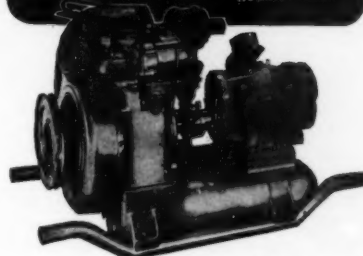
of the highest peak—are a division of Crook National Forest. The several fine improved campgrounds make a chain through the mountains so that hikers can spend five days or a week traveling the crest. However, they can all be reached by car, as can the best eastside fishing streams.

The most pleasant months for camping in the Pinalenos and other high southeastern Arizona ranges are June and September. During the summer rainy season in July and August thunderstorms are prevalent and it is likely to be rather wet and chilly above 8000 feet. Perhaps the finest time of all to visit these forests in the sky is from September 15 to mid-October. Then it is Indian summer in the high country and there is a nip in the air. Aspens are splashes of yellow on the mountainsides, while flaming red maples and russet oaks outline the canyons.

But whenever you come—whether high-piled thunder clouds of summer tower above the peaks or deep winter snows lie in the silent forests—these mountain oases exert the same magnetic attraction upon those who know them as do remote islands in the sea. These are some of the least visited mountains in the United States, but they are waiting high above the deserts of southeastern Arizona for those who appreciate the open sky, far horizons, freedom from crowds and the peace and satisfaction which can best be found in nature's wildest places.

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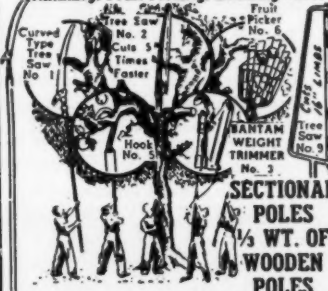
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FOREST PROTECTION (Second Edition), by Ralph C. Hawley and Paul W. Stickel. Published by John Wiley & Sons, Inc., New York City. 355 pages. Price, \$4.50.

The aim of this important volume is to give the student of forestry a well-balanced knowledge of the entire problem of forest protection in relation to the development of forests. And in this the authors are highly successful. A revision and modernization of Professor Hawley's earlier book on the same subject, this second edition is in essence a special study of such sources of forest injury as fire, on which the greatest emphasis is placed, insects and disease. However, every possible source of injury to the forest is considered.

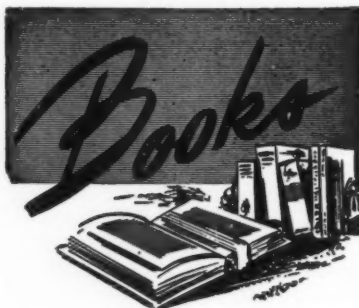
THE INSECT WORLD OF J. HENRY FABRE, by Edwin Way Teale. Published by Dodd, Mead & Company, New York City. 327 pages. Price \$3.50.

Victor Hugo said it neatly when he referred to Fabre as the "Homer of the Insects." Hundreds of thousands of readers who have already been introduced to this amazing realm by the great French entomologist will readily concur with the validity of this definition and will also be delighted with this new volume of Fabre's writings edited by Mr. Teale.

Fabre is simply terrific. Few horror tales, including those of Poe, can outgrip "The Courtship of the Scorpion" in which the scorpion bride devours her groom in their suite after a pretty honeymoon carefully described by the writer.

There's all manner of absorbing stuff in this volume including the record of the "pine processionary caterpillars" that marched in a closed circle, unable to break the chain, until they died; the stories of the great peacock moths; the ingenuity of the burying beetles; the instinctive wisdom of the hunting wasp; the incredible aerial ride of the oil beetle that carries its own food; and the behavior of the Scarab beetle—an obstinate, ornery insect if ever there was one.

As you might guess, some of these characters out of Fabre are not very pretty. But they are never dull. As Hugo noted, Fabre writes in the Homeric mold and his observations were based on fact. In perusing his study of scorpions, Fabre remarked that he dreamed they were sauntering over his face. This is readily understandable to anyone who reads this book. Fabre's insects are very convincing.



THE SPORT OF ORIENTEERING, by Stig Hedenstrom and Bjorn Kjellstrom. Published by Silva Ltd., Toronto, Canada. 120 pages, illus. Price \$2.

This book will give devotees of woods and fields some new ideas for outdoor recreation, instruction and competitive games for the purpose of developing ability in the correct use of map and compass. It deals with the Swedish national sport of orienteering, which is built around the ability of finding one's way from place to place in unknown territory by means of a map and compass.

The authors, orienteering enthusiasts for twenty years, describe the basic rules of the sport and its different variations. They point out the knowledge gained is essential for all outdoor sportsmen such as fishermen, hunters, explorers and skiers, and that foresters and military personnel also need this training.

BRITAIN'S GREEN MANTLE, by A. G. Tansley. Published by George Allen and Unwin, Ltd., London, England; The Macmillan Company, New York. 293 pages, illus. Price \$5.

As the title suggests, this book describes the kinds of native vegetation found in the various sections of Britain. It traces the history of changes in England's woods downs, heaths, moorlands and bogs since the ice age. The information on plant life is detailed and complete without being too technical for the layman to understand.

FRESH WATER FISHING (Bait & Fly Casting, Spinning & Equipment), by Arthur H. Carhart. Published by A. S. Barnes & Company, New York City. 231 pages, illus. Price \$5.

"Let's get our lure and our lures tuned up and get going" the author remarks in the opening chapter of his new book and the chances are that many of America's fifteen million fishermen will go along with him for it's a delightful trip—a book of

"why's" rather than "must's," or to put it another way, a book of reasons instead of rules.

For sixteen information-packed chapters he draws on a lifetime study of fish and their habits that enables the reader to more accurately appraise conditions, gives him knowledge of how fresh fish react to those conditions, and establishes a foundation on which the intelligent angler can figure out his own campaign to get a good catch.

Author Carhart's easy-to-read style, eighteen beautiful kodachromes of flies and lures and Hamilton Greene's "how-to-do-it" drawings combine to make a splendid presentation of fishing facts—but there's more to the book than that.

Taking cognizance of the fact that more people go fishing than engage in any other sport—fishermen spend almost four times the amount paid out in support of all competitive sports—the author warns in a powerful concluding chapter that this great segment of the population has a tremendous stake in the whole conservation movement, not just one or two phases in which they happen to be directly interested.

EDUCATORS GUIDE TO FREE FILMS (Ninth Annual Edition), by Mary F. Horkimer and John W. Diffor. Published by Educators Progress Service, Randolph, Wisconsin. 355 pages. Price \$5.

This is an excellent source of information concerning films that may be obtained at little or no cost for use in schools, churches, or other groups. This ninth edition contains more than 500 films not listed in the previous edition. Information is given on availability and whether or not the borrower must pay cost of transporting the film. A brief sketch of what the film is about is also included as a guide to its worth to the potential user.

CRISSCROSS TRAILS, by Macy H. Lapham. Published by Willis E. Berg, Berkeley, California. 246 pages, illus. Price \$3.

Here is a narrative of a soil surveyor, a foremost pioneer in this field in the West. Macy Lapham relates in interesting style the changes he has noted in soil science during the fifty years he worked with it, and he weaves in many personal sidelights about the people he met. He has shared in countless successes and failures in soil survey work, and his observations are recounted in non-technical prose understandable to the layman.

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A NEW 270-page service manual featuring Allis-Chalmers' HD-5 crawler has just been released. Instructions include a complete guide on proper operation, maintenance and repair of this new postwar tractor.

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A REPORT on the outstanding characteristics and uses of Greenheart, a wood which grows in British Guiana, and is particularly suited for marine and heavy duty construction, is being distributed by Greenheart and Wallaba Timber Company, Inc., 52 Vanderbilt Avenue, New York 17, N. Y.

THE KELSEY Nursery Service has issued a complete garden guide for 1950, free on request (25 cents west of Iowa). Write Department DI-50 Church Street, New York 7, N. Y.

HOW to Make Mine Timbers and Ties Last Longer—a manual on use and application of wood preservatives, issued by Osmose Wood Preserving Company of America, Inc., Buffalo 12, N. Y.

WHAT tool and how to use it, is a thumbnail description of *Tree Tool Catalog No. 31* issued by Bartlett Manufacturing Company, 3019 East Grand Blvd., Detroit 2, Michigan.

New York's Water

(From page 21)

lion gallons planned. But the way was left open for the city to seek additional allocations when conditions required.

Water-consumption charts show that from 1940 through 1948 New York's use of water rose from 922.7 million gallons daily to 1,172.3 million gallons daily.

The figures for this year so far show that for 1949 New York's estimated present 8,020,000 population will have used about 1194 million gallons daily.

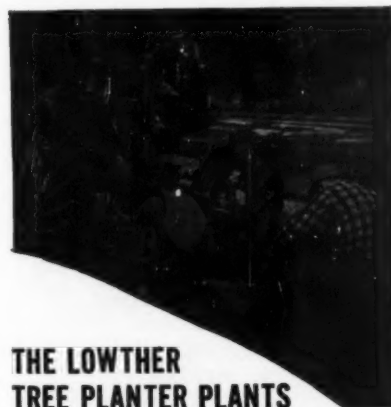
With the population rising at an estimated 30,000 persons a year, the water engineers' charts indicate the following water usage by New York for the next seven years:

Year	Gallons per day	Population
1950	1,176,000,000	8,050,000
1951	1,207,000,000	8,080,000
1952	1,238,000,000	8,110,000
1953	1,269,000,000	8,140,000
1954	1,300,000,000	8,170,000
1955	1,331,000,000	8,200,000
1956	1,362,000,000	8,230,000

At the conclusion of the nip-and-tuck race, in 1956, when the full reserves of the new Delaware system are available, the dependable yield of the entire city resources according to engineers' estimates will be 1400 million gallons daily. The normal yield of the combined system may be expected to rise about 200 million gallons daily above that figure.

But this expansion of the water system will meet the city's needs only for the next six or seven years; the long-range problem remains. Recent studies indicate that New York's population may be expected to grow steadily until around 1970, when it will level off at about 8,585,000 persons. And water engineers are already looking ahead, trying to find sources of potable water to keep pace with the city's prospective growth.

Irving V. A. Huie, president of the New York City Board of Water Supply, considers the main Delaware River—which for part of its course



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Our newest ALL BALL BEARING PUMP is designed to give maximum utilization of the limited supply of water that can be carried aboard a Tank Truck.

IT'S PERFORMANCE IS

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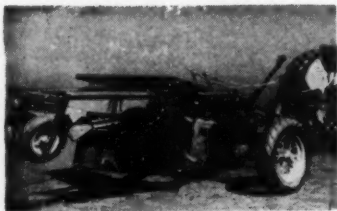
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THE RENOWNED
Rich Forest Fire Fighting Tool
Write for Prices and Description
Geneva Rich Bickel **WOOLRICH, PA.**



COMPANION "WORK HORSES" . . . HALE HPZZ and FZZ

Shown in action above is the Hale Portable Type HPZZ—companion "workhorse" to the popular portable Hale Type FZZ.

Like the FZZ, the Type HPZZ can be carried easily by two men. It will supply an effective fire stream to fires as far as a mile from the pump—thru 1½" hose and 5/16" nozzle. Pumps from draft 15 GPM at 200

lbs., up to 50 GPM at 100 lbs.

Both units are available in Frame; on wheels; or on rubber-cushioned steel channels.

Write today for folders on HPZZ and FZZ to:

HALE FIRE PUMP COMPANY
CONSHOHOCKEN, PA.

Picture at right shows effective fire stream from an FZZ carried in the truck and pumping from booster tank. The unit is used for fighting brush, field and forest fires while truck is in motion. An FZZ pumps from draft 60 GPM at 90 lbs. up to 150 at 30 lbs.



forms the boundary between New York and Pennsylvania—as the last upland source of water remaining to the city.

A study of the use of the main part of the Delaware River is being made by the Interstate Commission for the Delaware River Basin, a semi-official body designated by the Legislatures of New York, New Jersey, Pennsylvania and Delaware. This Commission is to make its full engineering report in 1951.

Last weekend the Commission announced that it was formulating a program calling for the reconstruction of a series of dams and reservoirs in the Upper Delaware Valley.

While officials of the Commission have declined to discuss the possible sites of the reservoirs or dams of the proposed new system, engineers studying their charts have noted that the closest approach, geographically, of the main Delaware River to New York City is about at Port Jervis, N. Y. This community touches on the three states most concerned—New York, New Jersey and Pennsylvania.

But there is no place in this region well adapted to the construction of the immense storage reservoir which the city would have to build to im-

pound its share of the waters of the main Delaware stream. To find country topographically suited for such a development, engineers believe, one must follow the Delaware upstream as far as Hancock, N. Y.

Somewhere in this area, on the border between New York and Pennsylvania, the job could be done. And it may well be the approximate site of New York City's next great water project.

Meanwhile, a group of New York engineers has been making exhaustive studies of where New York can go to obtain more immediate additional supplies of water. In a preliminary report some time ago, this group held that there were four possible sources of water for New York City: (1) streams in the Delaware watershed, (2) streams situated between the Rondout watershed and the Hudson River (3) the Hudson River and streams east of the Hudson River, and (4) conservation measures by the city.

Studies are even underway for possible future emergency use of the Hudson River to increase the city's water supplies. If the project materializes, a gigantic pumping station will be built near the point, north of Newburgh, N. Y., where the city's Delaware Aqueduct crosses 600 feet below the Hudson River bed. Tests have shown the water can be purified.

The contemplated connection would take at least a year to build.

Chief Engineer Edward J. Clark, of the Department of Water Supply, Gas and Electricity, said over the radio recently that any connection to the Hudson River would be used only in case of emergency—and the emergency would have to be worse than the current one.

New York public sentiment probably would be against drinking water from the Hudson River. But then, if New Yorkers will waste good Catskill-Croton water at the rate of 200,000,000 gallons a day, they may not be in a position to protest too much wherever their water comes from.

AUTHORS

CHARLES G. BENNETT (*New York Water Supply: A Long-Range Problem*) is a *New York Times* writer. **I. T. HAIG** (*Solving the Riddle of Low Grade Hardwoods*) is director of the Southeastern Forest Experiment Station, Asheville, North Carolina. **WELDON F. HEALD** (*Forests in the Desert*) is a Hereford, Arizona, writer.

This Month With The AFA

AFA members reelected the following officers for 1950 in the year-end ballot: A. C. Spurr, president; John M. Christie, treasurer, and five directors, Walter J. Damtoft, Karl T. Frederick, Don P. Johnston, Randolph G. Pack and James J. Storrow.

The 21 honorary vice presidents selected are: W. C. Bailey, Tennessee, president, First National Bank of Clarksville; Folke Becker, Wisconsin, president, Trees for Tomorrow, Inc.; Charles F. Brannan, District of Columbia, the Secretary of Agriculture; Raymond J. Brown, New York, editor of *Outdoor Life*; Mrs. Le Roy Clark, New Jersey, chairman, Conservation Committee of the Garden Club of America; Donald Comer, Sr., Alabama, chairman of the Board of Directors, Avondale Mills of Alabama; Dr. Wilson Compton, Washington, president, Washington State College; E. J. Condon, Illinois, director of public relations of Sears Roebuck and Company; L. A. Danse, Michigan, General Motors Corporation and member, President's Water Pollution Control Advisory Board; Walter E. Disney, California, president, Walt Disney Productions, Limited; Aubrey Drury, California, administrative secretary of the Save-the-Redwoods League; Walter E. Humphrey, Texas, editor, The Fort Worth Press; Joseph F. Kaylor, Maryland, president Association of State Foresters; Miss Ethel L. Larsen, Michigan, chairman, the Conservation of Natural Resources Committee of the General Federation of Women's Clubs; George Houk Mead, Ohio, member, National Citizens Commission for the Public Schools; Leslie A. Miller, Wyoming, chairman of the Committee on Natural Resources Commission on Organization of the Executive Branch of the Government; W. A. Roberts, Wisconsin, vice-president, Allis-Chalmers Manufacturing Company; Dr. Paul E. Tilford, Ohio, secretary-treasurer, National Arborist Association, Inc.; William Vogt, District of Columbia, author and lecturer; Edward A. Wayne, Virginia, vice-president of the Federal Reserve Bank of Richmond, and Vertrees Young, Louisiana, vice-president of the Gaylord Container Corporation.

Bryce C. Browning of New Philadelphia, Ohio, was appointed by the Board in December to serve as a director for 1950. He fills the unexpired term of E. L. Kurth of Lufkin, Texas, who resigned. We will miss Mr. Kurth but welcome Mr. Browning back to the Board. He served as AFA director from 1943 through 1947. He is close to conservation as secretary-treasurer of the Muskingum Watershed Conservancy District. Mr. Browning also received one of the Association's six 1949 conservation awards.

Congratulations to Ruth Burckman and Lawrence M. Johnson of Idaho for their splendid achievements in 4-H Club forestry work in 1949, nominated by assistant extension forester Vernon H. Burlison. Each received specially engraved AFA medals.

Our dynamic friend, Tom Page, agricultural director of WNBC, New York, has come out with a splendid guide of forestry management services available to small woodland owners in eleven northeastern states. It lists addresses of foresters, and forestry schools and contains state bulletin lists and important timber management when-to-do dates. AFA's interested should drop a line to Tom at WNBC, RCA Building, New York 20, and ask for a copy of "Woods Wealth."

What kind of men are foresters? If, like many Americans, you think of foresters as men in leather boots, corduroy breeches, and plaid shirts directing a logging crew, sighting around the horizon from a fire lookout tower, or safeguarding tourists and national parks from each other—here's news for you.

The men you're thinking of are foresters by the old way of thinking, right enough—or they are foresters' semi-professional colleagues, rangers—but they are only a part of the modern story.

Today, as Dean Joseph S. Illick, of the New York State College of Forestry puts it, foresters as a group are men trained to serve wherever wood serves. That overall responsibility puts them squarely in industry, full partners of men who make paper,

furniture, rayon, plywood, wallboard, linoleum and plastics, to mention a few scattered products.

Theme of an article by Charles D. Bonsted, associate professor of forestry at Syracuse, this analysis of a present-day forester's equipment appeared in the November issue of the New York State Department of Labor's *Industrial Bulletin*. Previously this material had been developed by Dean Illick and Professor Bonsted in an ingenious pamphlet.

Tersely written and cleverly illustrated with cartoons, the pamphlet states that present-day foresters are potential managers of lands and forests, authorities on wood's technical properties, know the business of pulp and paper manufacture from raw material to finished product, have a working knowledge of recreation planning, are highly trained in natural sciences and, finally, are able salesmen of products made of wood.

S. L. F.

75th anniversary year—Back in 1875 The American Forestry Association was organized to stimulate interest and action in forest conservation. Through its members and many friends it has wielded a powerful influence in helping to develop many forest conservation programs in the nation.

All AFA'ers can be proud of these accomplishments. This is a year to look ahead to new horizons—to project new activities—to expand our force through an expanded membership.

We would like to suggest that each AFA member make it his personal goal to enlist one friend as a member in 1950.

New AFA Director



Bryce C. Browning, New Philadelphia, Ohio, named an AFA director to fill unexpired term of E. L. Kurth, Texas

EDITORIAL

Clipped Wings Over the Wilderness

President Truman's executive order creating an airspace reservation over the million-acre roadless area of the Superior National Forest in Minnesota is a striking victory for the wilderness movement—and for conservationists and organizations, including The American Forestry Association, who have labored for more than a quarter of a century to preserve the primitive character of this famous canoe country along the Minnesota-Ontario border.

In essence, the President's order closes this great water wilderness to private and commercial planes, thus eliminating the air traffic now flowing in such heavy volume to lakes and waterways primarily reserved for wilderness canoe travel. General flying will be banned after January 1, 1951; resorts that have built up on private lands within the area cannot be served by air after January 1, 1952. And after this date all planes flying over the area for distant designations must keep above 4000 feet.

This unprecedented action, bitterly fought by aviation and other groups, will be widely denounced and contested during the months ahead. But it can be taken for granted that the President, as well as the Secretary of Agriculture who initiated the order, and the Secretary of the Interior who supported it, are prepared to defend it if the need arises.

This executive move to preserve wilderness values emphasizes again by official recognition that the Quetico-Superior country is worth fighting for.

In 1930 Congress passed the Shipstead-Nolan Bill to save the shorelines of the lakes and waterways; three years later the State of Minnesota passed a similar law covering state-owned lands within the area. In 1934, the International Joint Commission denied a pending application for an enormous power development scheme in the region. The same year the Quetico-Superior Committee was established by executive order to formulate a program for its preservation. In 1939 the U. S. Forest Service formally established the roadless areas of the Superior forest, a million acres of superlative wilderness, unmatched anywhere on the North American continent within easy reach of large centers of population. In 1948 Congress passed, and President Truman signed Public Law 733 which authorized an appropriation of \$500,000 for the more rapid acquisition of private lands still lying within the area. And last year Congress made the first allocation of funds from this authorization.

Thus the airspace order, signed on December 19, is a great step toward the realization of the plan to establish an

International Peace Memorial Forest in the region. The Quetico-Superior program has as one of its major tenets preservation of the wilderness interior on both sides of the border. What is now needed is a treaty between Canada and the United States setting up common administrative policies, without changing jurisdiction on either side. With this the famous Quetico-Superior country will be jointly dedicated as a memorial to lasting peace between the two great nations.

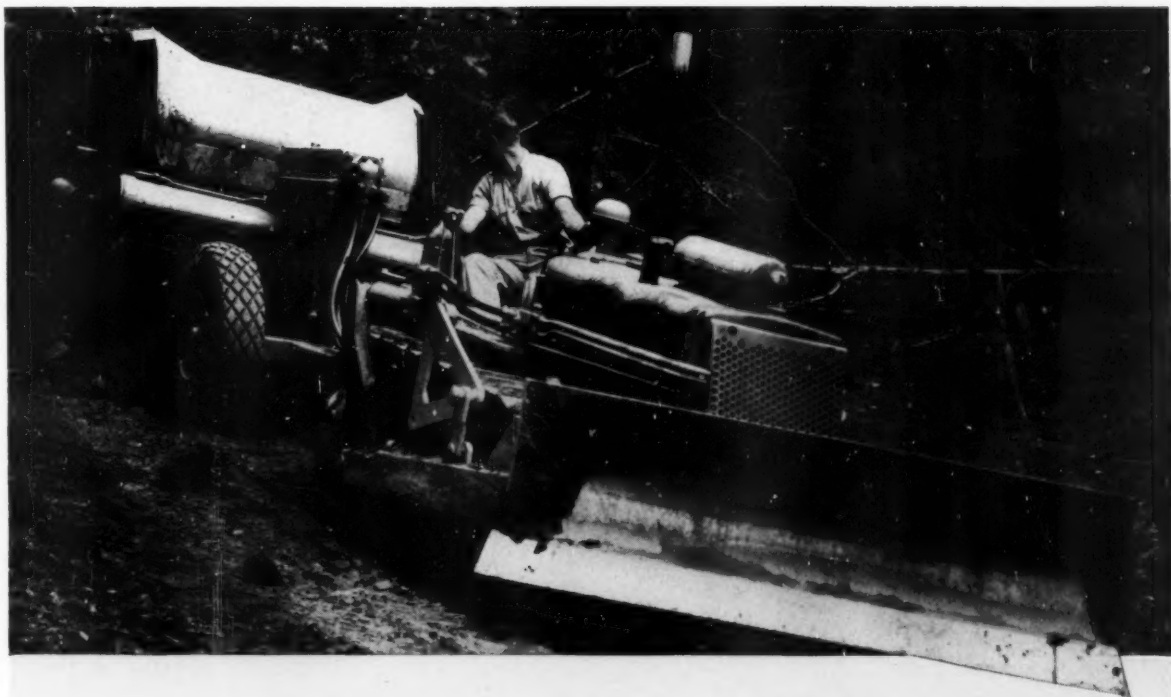
Mr. Rockefeller and Natural Beauty

It is doubtful if many Americans, reading recent newspaper accounts of a gift by John D. Rockefeller, Jr., of thousands of acres of land in Jackson Hole, Wyoming, to the Grand Teton National Park and adjoining Jackson Hole National Monument, are aware of the true breadth of the Rockefeller interest and generosity in preserving natural beauty. His monumental restoration of Colonial Williamsburg in Virginia is modern history—but the size of his contribution to the development of our great system of national parks and monuments is not generally known or appreciated by the beneficiaries, the American people.

For example, how many of the millions who today enjoy the sweeping panoramas of Great Smoky Mountains National Park in North Carolina and Tennessee, recall that Mr. Rockefeller contributed \$5,000,000 toward the cost of acquiring park lands? How many citizens are aware that he donated \$3,000,000 in roads, lands and improvements to beautiful Acadia National Park in Maine? Or that he gave nearly \$2,000,000 to save a magnificent stand of sugar pines in the Yosemite National Park of California? Or that another \$2,000,000 was given to the State of California through the Save-the-Redwoods League to preserve as a state park the cathedral-like grove of redwood giants—possibly the tallest trees in the world—in Bull Creek Flat along the famous Redwood Highway?

Yellowstone in Wyoming, Crater Lake in Oregon, Mesa Verde in Colorado, Shenandoah in Virginia—all great national parks—have been enriched over the years by Mr. Rockefeller's generosity.

Thus the Jackson Hole lands, deeded to the government on December 16 by his son, Laurance S. Rockefeller, at a colorful ceremony in Washington, add to his stature as a champion of natural beauty. The American people owe a debt of gratitude to John D. Rockefeller, Jr., and to his family and associates who are carrying on with the plans he conceived and developed over the past quarter century.



YELLOW "FIRE ENGINE"

FIRE-FIGHTING equipment is only as good as the access roads that get it to the trouble spot. That's why this "Caterpillar" matched road-building set is vitally important to any fire-control unit or agency.

The 43 drawbar horsepower D4 and angling No. 4A 'Dozer, with a No. 40 Scraper, shown above, guarantees low-cost construction of fire-access roads. The Scraper has a 4.5 heaped cubic yard capacity — makes the 400-foot haul with load every four minutes. Bringing in 3.6 cubic yards bank measure per trip, this all-"Caterpillar" unit handles 46 cubic yards per hour.

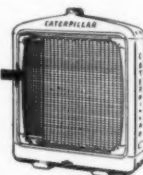
Here are some of the road-building features that should give this

earthmoving set high priority in your timber-saving budget:

- 1** Small, compact package—small operating and owning cost, but mighty big performance.
- 2** All hydraulic — 'Dozer or Scraper go to work at touch of changeover valve right next to operator. Space on rear of tractor for Hyster logging winch.
- 3** 'Dozer-type ejection on Scraper for complete load elimination.
- 4** Rear wheels ride inside cut for working close to banks, trees.
- 5** 'Dozer blade can be quickly angled to meet all job needs.
- 6** "Caterpillar"—built all the way, with one manufacturer and one dealer organization to give you less down time, better service, if and when you need it.

LOOK UNDER THE HIDE

Lubricating oils break down at high operating temperatures, forming carbons, lacquers and gums—enemies of long engine life. To prevent lube oil breakdown, "Caterpillar" Engines are equipped with oil coolers. Pistons are oil sprayed to remove heat. Controlled oil temperature preserves lubricating qualities — reduces maintenance costs—adds to owner profits.



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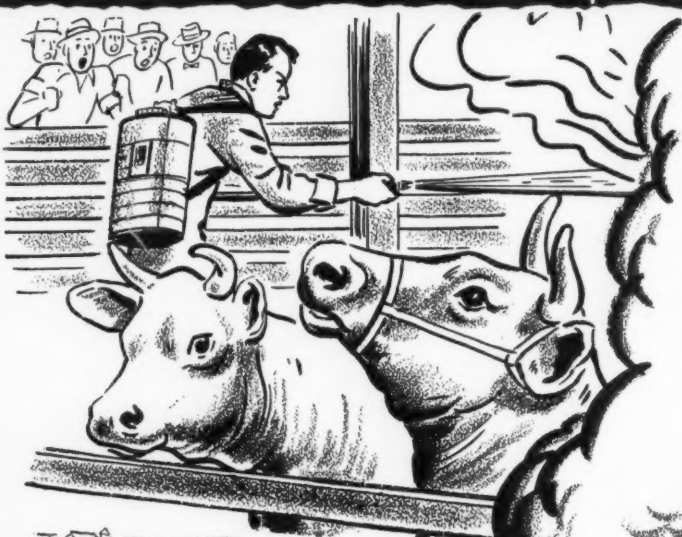
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"Indian Fire Pump SAVED BARN AND CATTLE"

At the County Fair we placed an **INDIAN FIRE PUMP** in one of our livestock barns where there was a great deal of bedding and debris. The second afternoon fire broke out in this barn and if it hadn't been for your pump the barn and a lot of cattle would have been destroyed.

100,000 people attended the fair and many of them saw the fire and how it was extinguished.

J. M. Savery,
Manager



"RAILROAD CREW USED INDIAN FIRE PUMPS TO CONTROL BURNING OF RIGHT-OF-WAY"

Two weeks ago, during the drouth, on a windy day it appeared the whole pasture country east of here was on fire. Several citizens jumped in their cars and drove in the direction of the fire until they reached the railroad. To their surprise they found the section men were merely burning off the right-of-way and then putting the fire out with **INDIAN FIRE PUMPS**.

This community needs no convincing as to the value of **INDIANS** and as soon as we had your price list we sold the pumps in advance and mailed you the order.

McKoy Hardware & Furniture Co.



"USED INDIAN FIRE PUMP TO PUT OUT ROOF FIRE..."

I received a request from a neighboring town to assist on a farmhouse fire. I sent in an alarm and then took my **INDIAN FIRE PUMP** to the scene in my car.

The barn was entirely enveloped in flame and beyond saving. There were 5 spot fires on the roof of the house. I climbed to the roof and put these fires out and kept the roof wet until the pump arrived. Without question my **INDIAN** saved the house.

We consider **INDIANS** a "must" in our department and highly recommend them.

Fred E. Dwinell,
Chairman Fire District



"DOES A SWELL JOB..."

Please send your **INDIAN FIRE PUMP** catalog. Our local fire department is equipped with 6 **INDIANS** on one truck and 4 on another. We use them often. The **INDIAN** is easy to operate and does a swell job and has never failed us.

Arthur L. Kimer,
Secretary, Volunteer Fire Co.

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